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The Harvard Summer School of Physical Education 1887-1932

By Clarence B. Van Wyck
Secretary to the Department of Physical Education
Harvard University, Cambridge, Mass.

FOREWORD

In the early years of this century, the Physical Education Summer School at Harvard University was one of the most potent forces in the development of physical education. Entirely confined to professional courses, the students went to Harvard because they wanted the training, not because they sought a degree; that was before the era of graduate degrees in physical education.

This Summer School was a common meeting ground of teachers and prospective teachers from many types of institutions: schools and colleges, Y.M.C.A.'s, Turnvereins, athletic clubs, playgrounds, and social settlements. The list of the names on the faculty always included men outstanding in the field—and to come under the influence of such men was a privilege. The atmosphere of the school was informal, and the program of classes and activities usually ran for eight hours a day!

No man alive is better qualified to write this history than Mr. C. B. Van Wyck. It will be read with the greatest of interest by those who were students in the school—and they constitute a surprisingly large proportion of our middle-aged teachers and older—and it contributes an important missing chapter in the recorded history of the development of American physical education.

C. H. McCloy,
State University of Iowa,
Harvard Summer School, 1905-1907.

THE task of compiling a history of the Harvard Summer School of Physical Education merits the services of a far more skillful pen than I am able to command. It is most unfortunate that the genius of a Leonard or of a McKenzie is not now available to record its achievements. In the pioneer days of physical education in America the influence of this school was felt from Maine to California, from Canada to the Gulf States. For many educators of the present generation its story needs no repeating because its influence touched their lives and gave them the technique and inspiration which have helped to make them successful leaders in their

chosen field of service. However, when at some future time the historian shall write in detail the record of the development of physical education in America, the contribution made by this School must not be forgotten. To keep the record clear I am, therefore, attempting as best I can to place in writing some of the outstanding facts concerning its long and fruitful life. In the interest of historical accuracy frequent reference will necessarily be made to Dr. Sargent, founder of the School and for more than thirty years its inspired leader.

The movement to provide American college students with adequate gymnasium facilities began with the erection of substantial buildings by Amherst, Yale, and Harvard in 1859, and by Princeton in 1869, but the real era of gymnasium construction in America was ushered in with the completion of the Hemenway Gymnasium at Harvard University in 1879. In the period between 1880 and 1890 expensive and well-equipped gymnasiums were erected at many college and preparatory schools. Educational leaders soon discovered, however, that the most completely equipped gymnasium was of little value without skilled supervision. Immediately they found themselves facing a difficult problem, for few teachers trained in physical education were available. The Normal College of the American Gymnastic Union was about the only institution then offering teacher-training courses in this field.

Partly because of his experience at Bowdoin College, at Yale, and in New York City, and partly because of the prestige associated with his position as Director of the most expensive and best equipped gymnasium in America, many college authorities turned to Dr. Sargent for help as they struggled to solve their difficult problem. As a result of these appeals, Dr. Sargent was forced to give his attention to that phase of physical education which was to bring to him his greatest fame. He became primarily a trainer of teachers and his duties as director of an exercise program for college students were gradually relegated to a position of secondary importance. In his *History of Physical Education* Dr. Leonard says: "We have already mentioned Dr. Sargent's contribution to the training of teachers. During his forty years at Hemenway Gymnasium his influence in this direction was more widely felt than that of any other man in America".

Soon after Dr. Sargent commenced his term of service as Director of the Hemenway Gymnasium, in September, 1879, he was invited by the authorities to provide some kind of gymnasium facilities for the students attending an institution then familiarly known as the Harvard Annex (now Radcliffe College). As a result of this request, he secured rooms and fitted them with a modest supply of gymnasium equipment where he not only pro-

vided a program of exercise for girls attending the Harvard Annex but also started a teacher-training course for women. This effort in 1881 marked the beginning of the Sargent School. In order to insure an enrollment which would justify the labor and expense involved, free tuition was offered to those who "would devote themselves for a period of one year to the study and practice of physical training with the view of becoming teachers." The great demand for physical training teachers at that time is graphically indicated by the fact that only one of the students who enrolled in September graduated from the course at the end of the year. All of the others had left to accept positions. A few weeks of instruction in the use of Indian clubs and dumb-bells seemed to be all that was necessary to qualify a teacher for profitable employment. It is interesting to note that forty years were to pass before the supply of well-trained teachers in this field of education was to catch up with the demand. As late as the period falling between 1910 and 1920, it was impossible to fill all of the calls for teachers which were received at the Hemenway Gymnasium. Not infrequently, in response to a request for a man for a $3,000 position, it became necessary to reply, "No suitable candidate available."

The scarcity of qualified teachers during the early eighties forced school and college authorities to place their gymnasiums in charge of directors who had received little technical training, and when these teachers found themselves settled in well-paying positions they naturally were reluctant to make the financial sacrifice required by a year of attendance at a teacher-training school. Careful consideration of all the factors involved convinced Dr. Sargent that the only practical way to meet the needs of the situation was through some kind of a summer school which students might attend without sacrificing the profitable positions they were holding during the academic year. He, therefore, recommended that teacher-training courses in physical education be added to the curriculum of the Harvard Summer School, but his recommendation was received with little enthusiasm. The soundness of Dr. Sargent's judgment in analyzing the needs of this period was clearly demonstrated with the passing of time, for more than 80 per cent of all the students who attended the School throughout its forty-six summers held teaching positions during the academic year.

The following paragraph from Dr. Sargent's *Autobiography* indicates quite clearly some of the difficulties with which he was forced to contend:

> The college authorities, nameless potentates who in this anonymous capacity sway the collegiate world, worried greatly. First, the use of the college building and the granting of certificates at the end of the course gave quasi-recognition to that bugbear, that spectre, that goblin, the non-academic

subject. Secondly, they shook their heads dubiously at the coeducational freedom necessary in the practice of gymnastics and athletics. And in the third place, the more conservative, and most of them were more rather than less conservative, did not approve of the scandalously abbreviated costumes which physical exercise required for safety and comfort. Harvard was headed toward perilous rocks, if not toward destruction, and physical training would be its ruination. Radcliffe, in abounding zeal, discouraged its pupils from entering, and the Boston Medical and Surgical Journal, in its righteous sobriety, accused the College of starting a money-making proposition, that could offer nothing advantageous academically. In an editorial it denounced Harvard for opening the Summer School for Physical Education with the financial glitter in its eye, rather than with the gleam of "that truth that made us free."

To prevent any mistaken conclusions which might result from this quotation it should be understood that it was not the intent of Dr. Sargent to include President Eliot in his reference to "the college authorities," as is clearly indicated by a later paragraph in this article. In spite of opposition within and without its walls Harvard finally granted permission for the use of the Gymnasium with the understanding that Dr. Sargent would personally assume all financial and other responsibility for the conduct of the School. The first session was held during the summer of 1887. A single copy of the four-page circular issued at that time, announcing the "Summer Course of the Physical Training School for Teachers at the Hemenway Gymnasium, Harvard University," is to be found in the files of the Department of Physical Education at Harvard. This circular contained a paragraph outlining the "design of the School" which served as an introduction to the following announcements:

Course of Instruction

The course will consist of Lectures, Examinations, and Exercises condensed from the work of the winter course. A new system of exercises, especially adapted to the needs of school children, will be introduced for the first time.

Athletic Sports

The extensive athletic grounds immediately adjoining the Gymnasium and the boathouse accommodations on the river afford exceptional facilities for instruction and participation in out-of-door sports and games.

Certificates

In every case the applicant must pass a satisfactory examination in all of the work prescribed, and have taken a degree from a medical college in good standing in order to receive a full certificate.

The tuition for the five weeks of theory and practice was fifty dollars. Unfortunately, no subsequent record of the courses actually given during this session is now available nor is there any list of the instructors who assisted Dr. Sargent. The rule restricting the full certificate to candidates who were medical school graduates reflected the prevailing opinion of the time, which held that the

director of a college gymnasium ought to be a man holding a degree in medicine. Evidently this rule was enforced for only a single season as no reference is made to it in the announcements for subsequent summers.

In view of the limited amount of information offered and the modest program of courses announced in the circular, the response was nothing short of remarkable and can only be explained by the fact that the proposed school promised to meet a wide-felt need. When the session opened on July 6th, fifty-seven students enrolled, thirty-nine women and eighteen men. The geographical distribution of these students was prophetic of the nation-wide service which the School was to render with the passing of the years. An examination of the enrollment shows students in attendance from the following states: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Virginia, Alabama, Ohio, Illinois,. Michigan, Iowa, Wisconsin, Kansas, and Colorado. One student was registered from Canada. Twenty-eight of the fifty-seven students enrolled held academic degrees and eight of these were graduates in medicine.

The following members of the 1887 session later became well-known in the physical education world: Charles E. Adams, Instructor in Physical Training, Colby College; Belle Bovee, Instructor in Physical Training, Brearley School, New York City; John B. Crenshaw, Professor of Physical Culture, Randolph-Macon College; Fred H. Dodge, Instructor in Physical Training, Bates College; Dr. Delphine Hanna, Director of Women's Gymnasium, Oberlin College; Dr. Christopher P. Linhart, Instructor in Physical Culture, Newark Academy; Helen C. Putnam, Teacher of Gymnastics, Vassar College; Dr. Frank N. Whittier, Director of the Gymnasium, Bowdoin College. Two members of this session were to achieve national fame in their respective fields; Lieut. James Franklin Bell, Professor of Military Science at Southern Illinois Normal University, who became Major General during the World War; and Booker T. Washington, of Tuskegee Institute, outstanding leader of his race.

Apparently, the success attending the first session of the School determined its permanent status. The wide geographical distribution represented by the student body convinced the authorities that there was a real need for instruction in this field and physical education courses were immediately added to the schedule of studies offered by the Harvard Summer School. The administration of the program was placed on a budget but the courses were allowed to function as a separate department under the direction of Dr. Sargent. This department became commonly known as the Harvard Summer School of Physical Education.

A detailed list of the courses offered during the Summer of 1888 appears in the Harvard catalogue for that year. Work in theory included courses in Applied Anatomy, Physiology, Personal Hygiene, Anthropometry, Physical Diagnosis, Prescription of Exercise, and Treatment of Spinal Curvature. Dr. Sargent was assisted in the teaching of these courses by Dr. Edward H. Bradford, of the Harvard Medical School, Dr. W. S. Dennett, and Dr. Lena V. Ingraham. Practice courses consisted of instruction in Calisthenics, Free Movements, Light Gymnastics, Heavy Gymnastics, Marching, Methods, Gymnastic Games, Track and Field Athletics, Boxing, Fencing, and Swimming. This instruction, under the direction of Dr. Sargent, was conducted by Christian Eberhard, Director of the Gymnasium at the Boston Athletic Association, assisted by Professor William R. McDaniel of Western Maryland College; Harry S. Cornish, Instructor at the Boston Athletic Association; and Miss Ella G. Durgin, of Dover, New Hampshire. One member of this group is entitled to special recognition. Christian Eberhard served the School longer than any other instructor; in fact, his term of service was equal in years to that of Dr. Sargent. Starting with the season of 1888 he continued as a member of the teaching staff through the Summer of 1921. His contribution to the program was made in the field of light gymnastics and his class in Fancy Steps was one of the most popular in the schedule. A thorough understanding of his field, exceptional teaching ability and a never-failing, all-pervasive smile combined to endear him to the hearts of succeeding generations of students. Born in Germany, he had acquired an excellent command of English except in one particular. For him the letter "w" served in place of "r." His familiar command, "Lunge-wight!" will be recalled by many as one of those delightful memories which linger through the years.

In that conservative period which at times has been designated as "the horse and buggy age," some wise student of history was responsible for the statement that "good growth is slow growth." Judged by this standard the progress of the School in its early years certainly indicated a healthy condition. The high-water mark in registration was reached during the summer of 1892 with an enrollment of one hundred and eleven. During the first ten summers the average attendance was only seventy-seven, but any weakness which this comparatively small figure might seem to have indicated was more than off-set by the rapidity with which the fame of the School spread to all parts of the country. Students came from new states each summer and by the end of the tenth session thirty-eight states and four foreign countries had been represented in the student body. Of almost equal importance was the fact that the constructive

service rendered by the School had won the good will of many educational leaders.

The success achieved in this period was largely due to the vision and skill of Dr. Sargent in securing the services of the best teachers then available. The members of the teaching staff were listed in three groups: Lecturers, Instructors, and Student Assistants. Theory courses were in charge of Lecturers and practice courses in charge of Instructors. Student Assistants were allowed free tuition for such services as they were qualified to render.

The School was fortunate in having almost at its door a wealth of teaching experts for the courses in theory. The medical fraternity in Boston and the Faculty of the Harvard Medical School furnished an endless supply of distinguished specialists. During its early years there appeared on the list of lecturers such well-known men as Dr. Clarence J. Blake, Dr. Henry P. Bowditch, Dr. Elliott G. Brackett, Dr. Edward H. Bradford, Dr. Walter Channing, Dr. Edward M. Hartwell, Dr. Robert W. Lovett, Dr. J. Gardner Smith, and Dr. Myles Standish. Instructors for the classes in practice were drawn from widely separated points, and it would have been difficult to find anywhere in the country more skillful teachers of light and heavy gymnastics, of school and playground games, and of aesthetic dancing than the members of the Harvard staff.

The Student Assistant plan provided a sifting process which brought to light some of the best teaching talent which was then available. Many trained experts in gymnastics were induced to register as students at Harvard because of the great value attached to the Harvard Certificate by college presidents and head-masters of secondary schools. The technical ability of these men was quickly discovered by Dr. Sargent and some were persuaded to serve as Student Assistants. If they argued that their services were worth more than the amount of the tuition fee, the Doctor never failed to remind them of the prestige they were sure to acquire as members of the Harvard teaching staff. Many of the Instructors during the Sargent administration first served as Student Assistants for one or more summers.

Quantity as well as quality contributed to the early success of this educational venture. During the period from 1889 to 1898 the average student registration for each summer was less than ninety, while the average number of teachers including Lecturers, Instructors, and Student Assistants, was twenty-seven. In later years this figure sometimes ran as high as forty-five. Many an effort to start a teacher-training school has met with early disaster simply because the members of the teaching staff were limited to a small group of individuals drawn from a single locality.

The record of the School during its first years is somewhat

vague, and detailed information concerning its early history is largely limited to the material contained in the annual announcement of courses and the lists of teachers and students as they appear in the Harvard catalogues. Few of those who were associated with the School at that time are now available as sources of information but the record is sufficiently clear to make possible special mention of certain outstanding individuals and events.

When the fourth session of the School opened on June 30, 1890, there appeared in the list of registrants the name of a young student from the Medical School of McGill University. In later years he became well-known to the profession as an artist and educator of exceptional ability, and as Professor of Physical Education at the University of Pennsylvania,—Dr. R. Tait McKenzie. During the Summers of 1889, 1901, and 1905 he served as a Lecturer at Harvard. Dr. McKenzie never lost his interest in the School and never wavered in his loyalty to Dr. Sargent. In conversation with the writer just before the World War he stated in most emphatic language that, in his judgment, Dr. Sargent was the greatest leader America had produced in the field of physical education. He also expressed the hope that Harvard University would some time relieve Dr. Sargent of all administrative responsibility so that he might be free to compile the data he had accumulated and place in writing the results of his life's work. Unfortunately, Dr. Sargent never found time to organize this material and reduce it to written form.

A course in Swedish Gymnastics was offered in 1890 and the following summer Hartvig Nissen, who first introduced this form of exercise in America, in 1883, took charge of this instruction and also conducted a class in Massage. Mr. Nissen continued as a member of the teaching staff through 1914 although he was obliged to be absent for an occasional summer during this period.

Another student who was to attain prominence in the physical education world registered at the session of 1894—Dr. Fred Eugene Leonard, Professor of Hygiene and Physical Education at Oberlin College, who became widely known as the author of a History of Physical Education. Dr. Leonard served the School for fourteen summers as a Lecturer in Physiology and in History of Physical Education. An examination of the registration for this period will disclose many other familiar names including the following: Harriet Isabel Ballintine, Dr. Thomas D. Wood, Rebecca Stoneroad, Jessie H. Bancroft, Dr. John W. Bowler, William A. Stecher, Dr. Clyde E. Ehinger, Lory Prentiss, and Frederick W. Marvel.

In the announcement for the Summer of 1894 there appears this statement: "A swimming tank has been constructed in the basement of the Gymnasium especially for the School, in which lessons will be given in the different strokes, floating, treading water, diving

etc." There is no record to indicate that this pool was made available for the use of Harvard undergraduates during the academic year. It was quite small, not more than thirty feet long and ten fee wide, and was constructed of wood. As no provision was made for filtration the problem of sanitation soon developed and the cost of operation became prohibitive. Apparently the use of the tank was discontinued after two summers.

The session of 1894 also marked the introduction of a new form of gymnasium exercise for girls and women which had been developed by Melvin Ballou Gilbert, a dancing instructor of Portland, Maine. Mr. Gilbert had coordinated certain rhythmic arm movements with modified steps of the ballet and thus produced a form of exercise which combined vigorous activity with grace of movement. When visitors came to the Gymnasium to see this new form of dancing they often found their attention centered upon the technique of the instructor rather than upon the work of the class. There is always a fascination in watching any performance which approaches perfection and Mr. Gilbert was a master of the art of teaching. A strict disciplinarian, he conducted his classes with all the dignity and formality which is sometimes found in the college class room. This specialty was taught at the School by Mr. Gilbert for fifteen successive summers and, as a result, aesthetic dancing, or classic dancing as it was later called, became a popular form of gymnasium exercise for girls and women in all parts of the country.

As the record clearly indicates, the birth of this School represented a natural response to the needs of an age—an age which was beginning to understand but dimly the important part which physical training was to share in the development of the American system of education. During its early years Dr. Sargent allowed the School to develop slowly in accordance with current needs. At first no attempt was made to force an extensive program of study which its constituency was not then prepared to absorb, but gradually new subjects were added to the curriculum, and in the Summer of 1899 the first attempt was made to introduce a graded program. The announcement for that year contains the following statement: "The development of the subject of Physical Training during the past few years has made it impossible to cover the ground even superficially in a single season." The acute emergency which had prevailed during the eighties was slowly passing. Courses in physical education had been started at other institutions and a small but steadily increasing supply of comparatively well-trained teachers was becoming available. The time was, therefore, ripe for the inauguration of an enlarged program of study.

Those individuals who attended the School in its early years were not only given instruction in the theory and practice of

physical training but they also received an inspiration which made them enthusiastic crusaders in the fight to bring to their profession the recognition which was accorded to leaders in other fields of education. Technical skill and a firm belief in the importance of his subject are essential qualifications in the development of a successful teacher. A slight digression at this point may bring a clearer understanding of the nature of those forces which were helping to produce this important by-product in the training of teachers at Harvard. Early in his administration Dr. Sargent began suggesting to Harvard authorities the advisability of establishing an exercise requirement for undergraduates. This campaign culminated in a comprehensive report prepared for the Board of Overseers in 1897, in which he recommended the establishment of a required physical examination for all first-year students and also a course in required physical training for freshmen. The report was referred to the faculty of the University for consideration, but after many weeks of discussion the recommendations contained in the report failed to receive favorable action. To those who were closely associated with Dr. Sargent it became evident that he accepted this decision as final and that he then redoubled his efforts to bring to Summer School students an understanding appreciation of the importance of the place which physical training should hold in a comprehensive system of education. His favorite theme for discussion became "The Place for Physical Training in the School and College Curriculum." In passing it should be noted that the Harvard Faculty and Corporation later voted to adopt, in a modified form, both of the requirements which Dr. Sargent had recommended. The rule which requires that all first-year men shall have a medical examination became effective in 1914 and during the past twenty-three years Harvard freshmen have been required to report for exercise three days each week throughout the college year.

It is of course impossible to state with any degree of exactness the extent of the influence which Dr. Sargent and his students exerted in the struggle to place physical training on an educational basis in American colleges. That this influence was extensive seems to be indicated by the record. In 1879 Amherst College was the only institution where physical training had been thoroughly established as a regular course in the curriculum, but, in 1910, according to an investigation made by Dr. George L. Meylan of Columbia University, 87 per cent of the one hundred and fifty colleges and universities in the list of the Carnegie Foundation had adopted some form of required physical training. It is significant that physical directors and instructors from most of these institutions had at some time attended the Harvard Summer School.

As a result of the enlarged program of courses started in 1899

students found it necessary to spend two summers in residence in order to qualify for the full certificate. The theory courses assigned to the first year were Anatomy, Physiology, and History of Physical Education. More advanced work was reserved for the second year—Applied Anatomy, Anthropometry, First Aid, Physical Diagnosis, and Physiology of Exercise. Special lectures were also given in The Treatment of Spinal Curvature, Hygiene, and Testing for Normal Vision and Hearing. The practice program consisted of elementary and advanced classes in each of the following: School Exercises, Free Movements, Heavy Gymnastics, Light Gymnastics, Swedish Gymnastics, Fencing, Military Drill, Aesthetic Dancing, and Games. For men there was an optional course in practical gymnastics adapted for use in Young Men's Christian Association gymnasiums. This course was arranged and conducted by Dr. George L. Meylan who was then Medical Director at the Boston Young Men's Christian Association.

One characteristic peculiar to the enrollment of this early period is worthy of special mention. The student body in a school of this type would normally consist almost entirely of young people in training for a career, but examination of the Harvard registration between 1887 and 1900 shows a considerable group of mature individuals who came from various walks of life. In this group will be found the names of college professors, public school superintendents and principals, masters of secondary schools, ministers, doctors, lawyers, and business men. The broad appeal made by the School during its early years is indicative of the rapidly awakening interest in physical training which was beginning to spread throughout the eastern section of the country.

Anyone who seeks to render service in an educational institution will find that his efforts are likely to be more effective when he enjoys the sympathetic understanding of his superior; it matters not whether that superior be the head of a department or the president of the institution. In this respect Dr. Sargent was fortunate. Through the influence of President Eliot he had been brought to Harvard and given an appointment as Director of the Gymnasium and Assistant Professor of Physical Education. President Eliot was fully aware of the prejudice then prevalent in the academic world against granting educational recognition to physical training and probably understood even more clearly than Dr. Sargent the difficulty of the struggle which lay ahead. He was keenly interested in the pioneer work which was being done in the summer courses and repeatedly urged the wisdom of strengthening these courses by raising standards. As a result of his influence the most important forward step in the life of the School was taken in 1902. The program of graded courses which had been in effect during the past

three years was extended to cover four summers. This venture was made with a considerable degree of apprehension, as the additional courses meant increased expense and there was no assurance that many students would be willing to return for a third and fourth summer. The record of student registration, however, soon showed that these fears were groundless, for the average attendance during the first ten years of the expanded program was one hundred and fifty in contrast to the average of ninety-five which prevailed during the ten years previous to 1902. This increase in attendance was sufficiently large to indicate a steady and healthy growth and fully justified the step which provided for the extension of the program.

The annual announcement of the physical education courses had previously been included in the general Summer School bulletin, but a special physical education circular was issued for the Summer of 1902. This circular will be of interest to students of the history of physical education for it contains a statement of Dr. Sargent's conception of the training which a well-educated man in this field should receive. Thirty-seven theory subjects are here outlined in greater or less detail. When someone protested to Dr. Sargent that the School was not prepared to teach all of the subjects listed in the circular, his defense was that he had not promised to offer all of these subjects in any one summer—they represented an ideal which he hoped the School eventually would be able to achieve. In other words, he had prepared a syllabus which, in his opinion, outlined a complete course of training for the student in physical education.

The facilities of the Gymnasium were taxed to capacity by the additional classes which expansion of the program made necessary. Some of the theory courses were held in the near-by lecture halls of the University, but for a number of years all of the practice classes met in the Hemenway. This arrangement simplified the problem of administration and made possible a close supervision of the practice program. There followed a period of experimentation which resulted in the elimination of weaknesses and the establishment of such courses as were shown by experience to have the greatest value. This process of change and expansion continued for more than twelve years and it was not until the Summer of 1915 that the schedule became fairly well stabilized. An examination of the schedules printed in the appendix will give some idea of the process of evolution which took place during this period. The schedule for 1915 is of particular interest as it indicates the great variety of work that was offered both in theory and in practice. Upon the payment of two fees—$25.00 for theory and $25.00 for practice—the student was entitled to as much of this work as he could take in a single summer. There were no separate fees for special courses. This arrangement for tuition fees provides another explanation for the

success of the School. Nowhere else could a student get so much for his money.

Two outstanding characteristics marked the program of study during the Sargent administration. The Doctor believed that it was most important for teachers of physical training to have a thorough knowledge of the elements of anatomy and physiology and great emphasis was therefore placed on instruction in these subjects. A course in histology was introduced as an aid to a clearer understanding of elementary and advanced anatomy and physiology. This course claimed the attention of first-year students for an hour and a half each day. The second characteristic to which reference is made was the direct result of Dr. Sargent's conviction that a successful teacher of practice work must not only understand his subject but must also possess ability as a performer. The class leader should be prepared to demonstrate with good form any exercise which he attempted to teach. The practice program was accordingly organized on a basis which provided intensive training in games, dancing, and all forms of light and heavy gymnastics. As most of the students were engaged in teaching during the academic year, they had eight or nine months in which to make practical use of the instruction received in the summer courses. This alternating role of student and teacher provided the training and discipline which enabled the average individual to acquire excellent ability as a performer by the end of the fourth summer.

In the course of human development it often happens that an important forward step is handicapped by the presence of some minor defect which becomes a source of irritation, and, if not corrected, is likely to retard progress. When the program of courses required of candidates for the full certificate was extended to cover four summers an attempt was made, by way of experiment, to introduce a new method of grading. A credit point system was substituted for the conventional method of indicating grades by the use of letters. The announcement for 1902 contains a description of this complicated method of grading, but for our purpose it is sufficient to state that this system soon became a nightmare to candidates for the full certificate. It produced an indefinite record which left the candidate continuously in doubt as to his status in relation to graduation. Between 1902 and 1906 there was an average of only seven graduates each summer and the successful candidates were fully convinced that they had earned all of the recognition which the certificate brought to them.

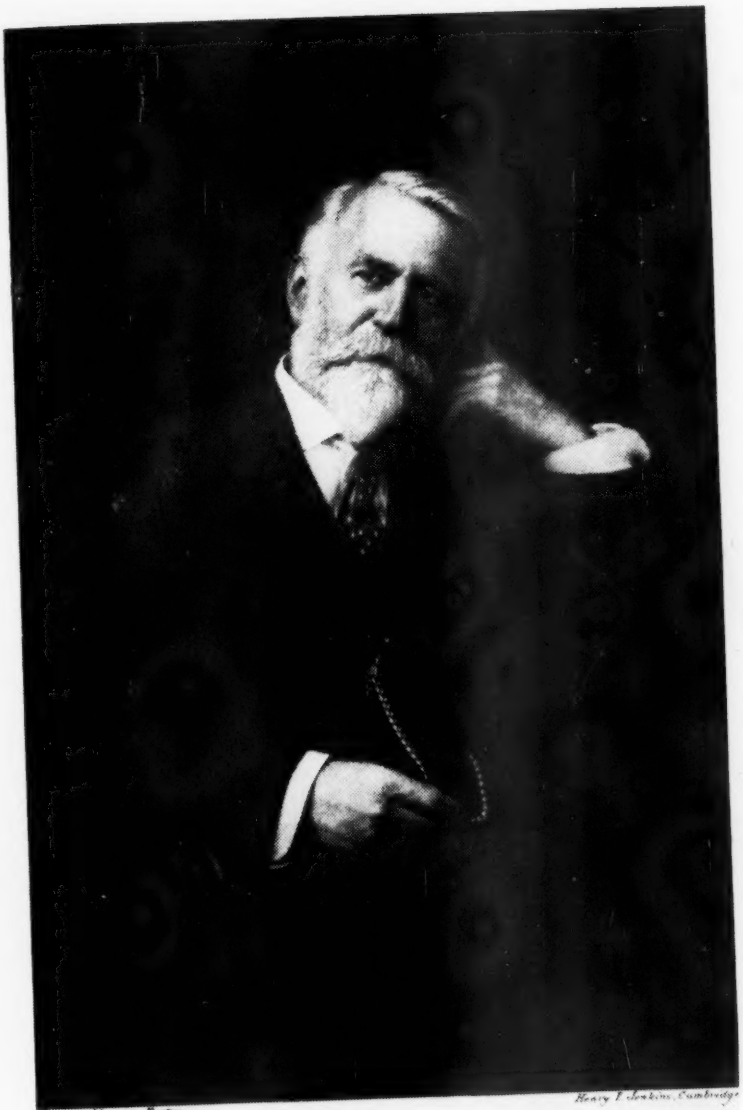
The correction of this administrative weakness was largely due to the efforts of Dr. James H. McCurdy of Springfield and Dr. Pierson S. Page of Andover who were then members of the teaching staff. They had sensed the nature and seriousness of the problem

with which the students were forced to contend and during the Summer of 1905, in conference with Dr. Sargent, developed a plan which clarified the requirements for graduation. This plan provided a minimum program of study consisting of three courses in theory and four courses in practice during each of the four years and at least two coaching courses. Upon satisfactory completion of this program the candidate would be entitled to receive the full certificate. A form for a schedule card was devised and arrangements were made to return to the conventional method of grading. The new system, which became effective in 1906 and continued in operation during the remainder of the life of the School, resulted in an increase in the number of candidates for the certificate and produced increased efficiency in administration. On registration day each student was required to fill out a schedule card, giving his name, address and a list of the subjects which he planned to take for credit. This schedule was approved by an officer of the School. At the close of the session grades were entered for each subject and the card then became the permanent office record for the student. The records of all students from 1906 to 1932 are preserved in this form and are most complete.

With the removal of the aforementioned handicap the School entered upon a period of prosperity which may properly be termed the "golden age" of the Sargent administration. The struggle to secure educational recognition for physical training in secondary schools and colleges had made decided progress; an excellent teaching staff gave strength to the program through continuity of service; graduates and former students were placed in influential positions; the value of the Harvard Certificate was widely recognized and the demand for well-trained teachers still exceeded the supply. Each year an increasing number of students returned to continue work for the certificate and the enrollment showed a steady gain. In other words the School was no longer an experiment—it had definitely made good.

The limited facilities of the Hemenway Gymnasium were soon outgrown and in 1910 all third- and fourth-year classes both in theory and practice were transferred to the new building of the Sargent School. The use of this building with its three gymnasiums and numerous lecture rooms provided an ideal arrangement except in one particular — many students carried mixed schedules of elementary and advanced work which made necessary frequent shifts from one building to the other. This difficulty was partially solved by the insertion of a five-minute intermission between practice periods.

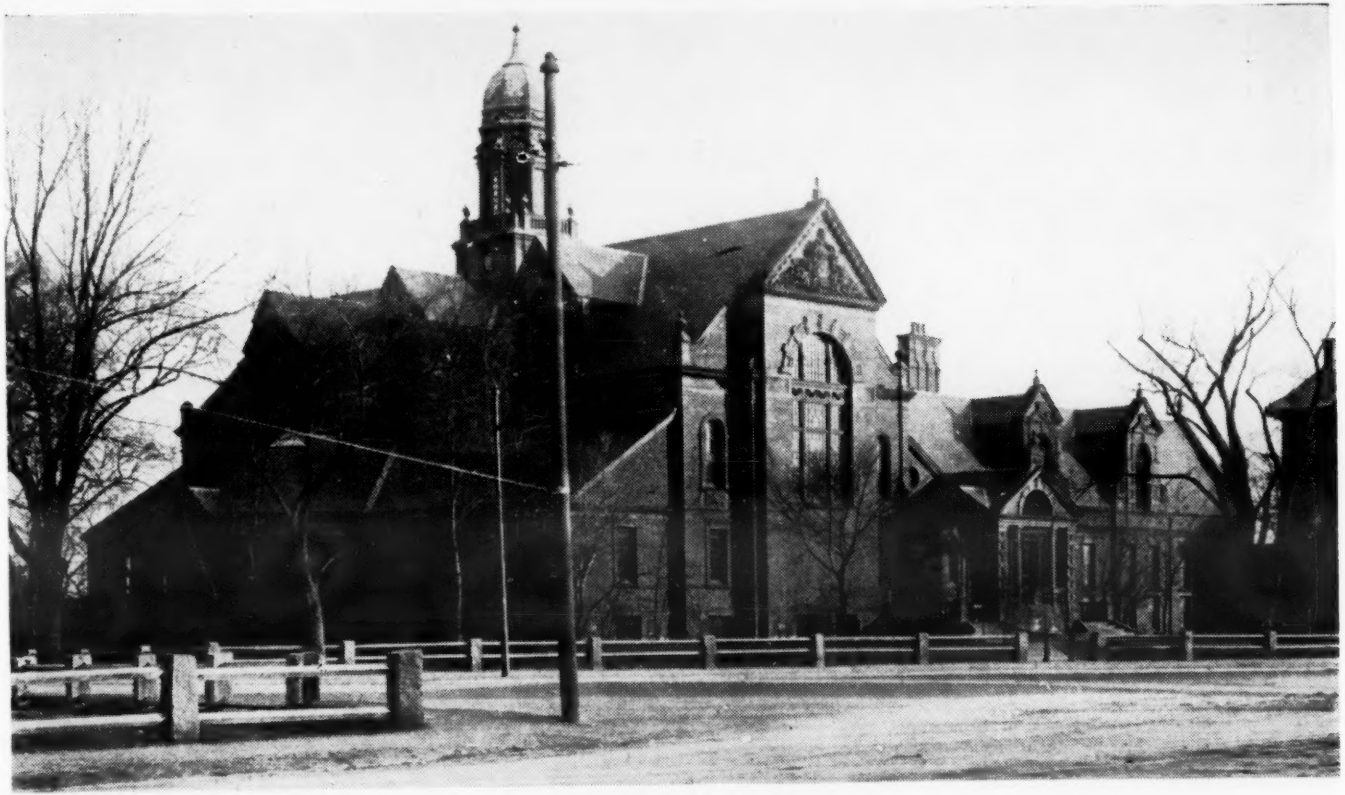
With the passing of the years the leadership of the School was stimulated by the challenge of a steadily expanding sphere of in-



Dudley A. Sargent.

1849 - 1924

Class of 1888



Hemenway Gymnasium, 1879-1938

Class of 1913

fluence. The season of 1914 brought a record attendance of two hundred and thirty students. An analysis of the registration for this year shows that the students held positions in colleges, secondary schools, public schools, normal schools, state institutions, Young Men's Christian Associations, Young Women's Christian Associations, and civic associations. Seventy-two claimed the title of physical director, thirty-six were listed as instructors in physical training, and forty-seven as grammar school and grade teachers. Two high school principals were also enrolled. Forty-two were undergraduates from colleges and normal schools. A tabulation of the home addresses shows that thirty-five states, the District of Columbia, Panama, Puerto Rico, Canada, and Turkey were represented in the geographical distribution.

One prominent feature long identified with the life of the School is worthy of attention. Exhibitions of practice work were held during the final week. At first there were sometimes three of these exhibitions but in later years they were limited to a single program which was held on the last Friday evening of the session. The exhibitions were open to the public by invitation; tickets of admission were issued and provision was made for seating as many guests as possible. Long before the hour for the program to start every seat would be taken and standing room would be at a premium. Each summer for many years these exhibitions attracted a crowd of spectators numbering between twelve and fourteen hundred. The participants in the program were drawn from advanced classes and there were always available some expert gymnasts qualified to give performances in tumbling and on the horizontal bar which compared favorably with the work of professionals. As a result of these factors the exhibitions were entertaining and seemed to be enjoyed equally well by spectator and by participant. Some critics claimed that it was not wise to spend any of the time allotted to a brief summer session in the preparation which was necessary for these demonstrations but Dr. Sargent believed that the advantages of this procedure more than compensated for the disadvantages. In his mind two objects were supreme: first, to train teachers; second, to educate the public. Each summer educational leaders from widely separated points were present in Cambridge and many attended the exhibitions. Thus there was provided one more agency for the spread of physical training propaganda. Incidentally the students were given a practical demonstration which showed them how to plan and administer a successful exhibition.

In the early days of the School Dr. Sargent held himself in readiness to conduct any of the theory courses for which no special lecturer was available, but in later years his teaching was confined to courses in Prescription, Anthropometry, and Applied Anatomy.

His favorite course was Anthropometry and as a result of his interest in this subject complete measurements of more than 18,000 Harvard students, taken between the years 1880 and 1918, are now preserved in the files of the Department of Anthropology at Harvard University. These records will become increasingly valuable in future years, and already have supplied the basis for one book, *New Types of Old Americans at Harvard,* by Gordon T. Bowles. In a convention address Dr. Earnest A. Hooton termed this one of the most important books published in the field of physical education in recent years.

In the preparation of this history it has been a comparatively simple matter to bring together a collection of important dates and events; far more difficult is the task of interpreting those intangible qualities which border on the realm of the spirit—morale, school loyalty, enthusiasm, and the inspiration which results from a mutual exchange of ideas and experiences. These are qualities common to the life of a college but unusual in a school which meets for only a few weeks during the year. All were present at Harvard, however, in a marked degree. Teachers found their tasks made more enjoyable by the cooperative attitude of students many of whom were teachers themselves. In the hard school of experience they had learned the value and importance of thorough training and were eager to absorb all that the courses had to offer. Registration day, in many respects, resembled a class reunion at a college commencement as old friendships were renewed and new friendships were formed. There was definitely present an atmosphere of enthusiasm which gave unmistakable evidence that the students were glad to be back for another summer. School loyalty found expression in a very practical manner and, as a result, it was never necessary to promote attendance by means of advertising. Most of the new members were brought to Cambridge through the influence of former students. The comment is frequently made that one of the greatest benefits to be derived from attendance at a physical education convention is found in the opportunity it affords for personal contacts and the exchange of ideas and experiences. If this is true of the convention, it was even more true of the Summer School, with one difference—the convention ends in two or three days, but summer students had five or six weeks in which to discuss their professional problems. The inspiration gained in this way constituted one of the valuable assets of the School.

During the war years following 1914 there was a gradual decrease in attendance and in 1918 it became necessary to hold all of the classes at the Sargent School as the Hemenway had been turned over to the Navy Department and was used as a barracks for men attending the Radio Training School. But in 1919 the first- and

second-year classes were back in the Hemenway and the upward trend in registration started once more.

The value of an article is often measured by the price which it commands in an open market. Some indication of the value which was placed on the Harvard Certificate is shown by the fact that students living at points as far distant as California were willing to invest the time and money required by attendance at the School for four successive summers. The importance of preserving permanent records was not appreciated in the early days and the official files contain no list of those who were awarded the Certificate in the period between 1887 and 1902. Such a list, if it were now available, would be most interesting, as doubtless it would include the names of many who, in later years, achieved positions of influence and leadership. Since 1902, however, the records are complete and show that the Certificate was awarded to six hundred and ninety-eight students representing all sections of the country.

For many years graduates of the Sargent School were rewarded for proficiency by having their diplomas engrossed with the words, "With honors in theory," "With honors in practice," or "With honors in theory and practice." This recognition was awarded to only one graduate of the Summer School. In 1914 a student completed the work of the program who had received grades of better than 95 per cent for each subject in theory and practice taken during four summers. Such an impressive record was so unusual that Dr. Sargent issued orders to have the Certificate for this student engrossed with the words, "With honors in theory and practice." The distinction of earning this recognition belongs to Miss Sydney Parsons of Brooklyn, N. Y.

The program of courses offered by the School furnishes a complete refutation of three fallacies concerning Dr. Sargent's theories which have persisted through the years. First, it was stated that he sought to establish a Sargent system of physical training. Nothing could be farther from the truth. He did attempt to develop a system of anthropometry in order to furnish a scientific background for this field of education, but in no sense could this be considered a system of physical training. Both the Swedish and German systems formed important parts on his summer program and he secured the best exponents available for instruction in these systems. Always alert for new developments he welcomed any form of exercise that possessed elements of value. Secondly, he was called "a formal gymnastics man." As a matter of fact, for many years, the Summer School offered the broadest program of recreational plays and games that could be found anywhere in America. Thirdly, it was said that he was the enemy of intercollegiate athletics. It is true that he did oppose the evils that prevailed in this field previous to 1920 and he

was a thorough believer in a policy of "athletics for all," but he always recognized the value of intercollegiate competition as a stimulus to a program of intramural athletics. Almost from the beginning coaching courses adapted to the promotion of intercollegiate athletics were offered as a regular feature of the summer program.

At the age of seventy and after forty years of service Dr. Sargent retired from his position at Harvard. The Summer of 1919 marked his final session with the School which he founded and had directed for so many years. The reluctance with which he terminated his services must have been tempered by a deep sense of satisfaction as he reviewed the accomplishments which lay behind him. As a student in Bowdoin College and in Yale Medical School he had the vision and courage to select those courses which would fit him for a profession which then did not even exist. While engaged in the study of medicine he had entertained the hope that he might eventually be appointed to a full-time position in the gymnasium at Yale, but upon graduation President Porter sought in every way to discourage him from taking up physical education as a profession and expressed the opinion that this kind of work was not worthy of a college-bred man. Letters addressed to the presidents of ten other colleges brought similar replies. And thus, in 1878, possessed of a thorough technical training and ten years of valuable experience, he was unable to find any college willing to give him an opportunity for the practice of his profession. What a contrast was presented by conditions as they prevailed in 1919! Physical training was thoroughly established on an educational basis in most secondary schools and colleges, heads of departments in this field were accorded professorial rank, and more than twenty-five of the states had adopted legislation which made provision for physical training in public school systems. The Faculty and Corporation of Harvard University, acting upon the recommendation of Dr. Roger I. Lee, Professor of Hygiene, had just voted to establish a program of required exercise for freshmen. To Dr. Sargent, more than to any other one man, belongs the credit for bringing about the changes which had occurred in this field of education during the forty years of his professional career.

Responsibility for the selection of a man to fill the place made vacant by the retirement of Dr. Sargent was delegated to Dr. Lee. Because of rapidly changing conditions in the physical education world this task was not a simple one. Athletics and recreational games were gradually supplanting formal gymnastics in programs of required exercise, some methods which had satisfied the simple needs of a pioneer period were no longer efficient, and new theories concerning the development of the human body were widely

prevalent. The position, therefore, called for a young man of progressive temperament but one with the poise and balance which would lead him to retain those methods of the past which possessed elements of permanent value. The candidate who was finally recommended to the Corporation of the University by Dr. Lee proved to be a most happy choice from the standpoint of the Summer School. William H. Geer was well qualified by temperament, training, and experience to meet the responsibilities of the position to which he had been called at a comparatively early age. During his college years at Carlton, qualities of leadership were developed by participation in Christian Association work, as class president and as manager of varsity football. His studies in the academic field were supplemented by a thorough technical training secured at Springfield College. In addition to valuable professional experience gained in New York State he brought to his position at Harvard a scholarly mind and a pleasing personality, but perhaps his most outstanding characteristic was an intense passion for service. He had a genuine interest in the personal welfare of the most humble employee in his Department and nothing gave him greater satisfaction than to be able to render a needed service to someone who came within his sphere of influence. In his administration of the Summer School the exercise of this quality made him the friend of all the students. They came to him freely with their problems and were always sure of a sympathetic hearing and sound advice. The influence of his quiet, forceful personality dominated the life of the School and helped to generate an atmosphere of enthusiasm which was shared by teachers and students alike.

When Mr. Geer began his administration at Harvard, conditions in this field of education, in one respect, were not unlike those which had prevailed at an earlier period. The need for teachers in colleges and secondary schools had been satisfied but a new field for teachers, in public school systems, had been created as a result of legislation adopted by a majority of the states. A limited supply of candidates was available for these positions and for a number of years physical education schools were kept busy trying to catch up with this new demand for teachers. At Harvard the enrollment for the Summer of 1920 surpassed all previous records and succeeding seasons brought consistent gains. The largest enrollment in the history of the School was recorded in the Summer of 1924, when three hundred and forty-seven students were in attendance.

During his first season Mr. Geer wisely made few changes in the program which had been developed by the previous administration. He was thus given an opportunity to estimate at first hand the value of the courses offered and also to observe the qualifications of his teaching staff. Such changes as later became effective were in

harmony with the trend of the period. Practice classes in wands, dumb-bells, Indian-clubs and other forms of light gymnastics were brought together and listed under the head of "Floor Work," and greater emphasis was placed upon athletic coaching courses. In theory, a few subjects of a semi-medical nature were discontinued in order to make room for such courses as Play in Education, Administration, and Hygiene which were of more immediate value to teachers in this field. Changes in the teaching staff were made when necessary but there was no let-down in the standards which the School had maintained for years. Many instructors of the Sargent administration were continued in service and the staff was strengthened by the addition of such men as Dr. Lee, Professor of Hygiene, Dean Holmes and Professor Johnson of the Graduate School of Education, and Norman W. Fradd and Daniel J. Kelly of the Department of Physical Education. The elementary theory courses were never more efficiently taught than during the last twelve years of the life of the School when Professor Howard E. Hamlin of Simmons College and the Sargent School was in charge of Anatomy and Applied Anatomy, and Dr. Percy G. Stiles of the Harvard Medical School conducted the courses in Physiology and Physiology of Exercise.

The fruitfulness of a man's life does not always depend upon its length as measured in terms of years. Mr. Geer's administration lasted for only five summers but during this brief period his contributions to the life of the School resulted both in improved efficiency and in definite progress. His greatest achievement was the provision he introduced which made it possible for physical education students who were graduates of approved colleges to become candidates for the Master's Degree in Education. This innovation was brought about with the aid and sympathetic cooperation of Dean Holmes and became effective in the Summer of 1922. Candidates for the degree were allowed to carry three lecture courses of thirty hours each and four thirty-minute practice periods. The practice work counted for a quarter-course credit and each of the theory courses for the same amount. No credit was given for courses in which the candidate received a grade of less than "B." Under this arrangement candidates were able to complete the equivalent of two half-courses each summer and to satisfy the requirements for the degree in four summers of residence. All candidates who secured the degree through summer work were required to submit a thesis on some subject approved by the Director. During the years immediately following 1922 one hundred and fifty-two students were admitted as candidates for the Ed.M. and of this number fifty-one were eventually awarded the degree.

Instruction in the theory of body mechanics was first given

during the Summer of 1920 in courses listed as Prescription and Corrective Exercise. These courses were conducted by Mr. Fradd and were continued through 1932. A study of the posture of Harvard undergraduates had been made by Dr. Lee and Dr. Lloyd T. Brown in 1916, and the Harvard Body Mechanics Charts were developed as a result of this investigation. The formation of correct postural habits during youth is now generally recognized as one of the important factors which contribute to good health in middle life. Experience has shown that with the use of the Harvard Chart as a standard it is possible for examining physicians to grade the posture of students with a fair degree of accuracy. Although no attempt has been made at commercialization each year has brought a steadily increasing demand for the Harvard Charts which are now used in all sections of the country.

In the tragic death of Mr. Geer, early in 1925, the profession lost a leader of great promise and the students lost the services of one who, in an unusual degree, combined the qualities both of teacher and of friend.

The session of 1925 was conducted under the supervision of Mr. Daniel J. Kelly who was then Assistant Director of Physical Education, but no changes were made in the program of courses which had been developed during the Geer administration. Before it was time for the session of 1926 to convene Dr. Charles H. Keene, Professor of Hygiene at the University of Buffalo, had been appointed Director of the School, a position which he held through 1932. Dr. Keene was a graduate of Harvard College, of the Harvard Medical School, and of the Harvard Summer School of Physical Education. For a number of years he had served as Supervisor of Physical Education in the Public Schools of Minneapolis and later held the position of Director of Physical Education for the State of Pennsylvania. He was thus well-fitted by training and experience to direct the administration of the School, but certain trends were beginning to develop which restricted any further growth or progress.

The question is often asked, "Why was this School discontinued?" To those who had an opportunity to observe, at first hand, certain changes which took place between 1924 and 1930, the reasons for its discontinuation were both clear and conclusive. Three factors, developing at about the same time, combined to make this result inevitable. First, the profession had become over-crowded as a result of the teacher-training courses in physical education which had been started at many State Universities and State Teachers Colleges during the period directly following the war. In the second place, the value of the Harvard Certificate had been seriously impaired by legislation adopted in many States requiring that a teacher must hold a bachelor's degree in order to qualify for certifi-

cation. The third factor was entirely of a local nature. In 1927 the requirements for the degree of Ed.M. in the Harvard Graduate School of Education were increased from four courses to eight courses, and this meant that students majoring in physical education would be required to spend eight summers in residence in order to qualify for graduation. Few students had the courage to look forward to such a long period of graduate work and the number of new candidates for the degree immediately declined almost to the zero point. If there had been no change in the requirements it is probable that the School would have continued indefinitely and that, gradually, the curriculum would have developed into a program planned exclusively for graduate students. Operating on such a basis it would have helped to improve the training of teachers who were already in the field, but would not have prepared new teachers for an over-crowded profession. Early in the year 1930 announcement was made that the physical education courses would be discontinued after the Summer of 1932. This arrangement made it possible for students who had started work on the program to complete the requirements for the Certificate.

The usefulness of a school is determined primarily by the personal qualifications and efficiency of its teachers, and this history would be incomplete if it did not give recognition to those teachers who made a definite contribution to the life of the Harvard Summer School through long years of faithful service.

Jennie B. Wilson, well-known to hundreds of graduates of the Sargent School, was on the staff of the Summer School from 1890 to 1910. She conducted classes in general gymnastics for women and specialized in Indian club work.

Carl L. Schrader registered as a student in 1899. For twenty-three summers he served successively as Student Assistant, Instructor, Chief Instructor, and Assistant Director. His field of instruction included all forms of gymnastics but probably he will be best remembered because of his courses in Marching Tactics and in Methods.

Dr. Charles B. Lewis became a member of the teaching staff in 1904 when he was listed as Instructor in General Gymnastics. His specialty was teaching graded classes in Indian club exercises and for many years he was also in charge of the laboratory course in Histology.

Alfred Brodbeck was an expert both in gymnastics and in track athletics. During a period of twenty-five years the services he rendered to the School were invaluable. His strictness as a disciplinarian was softened by his keen and never-failing sense of humor.

Howard R. Reiter of Princeton football fame, familiarly known

to all his friends as "Bosey," entered the School as a student in 1907. For twenty years he taught to summer students at Harvard not only the fundamentals of football but also the principles underlying the development of sound character. He was one of the most popular instructors identified with the School during any period of its history.

Mary McGrath McCormick began her services with the School in 1913 and continued as a member of the teaching staff through 1932. She was first listed as an Instructor in General Gymnastics but after a few summers her work was confined to classes in æsthetic dancing and in folk dancing. Unusual teaching ability and a helpful personality combined to make her a constructive force in the development of teachers.

Harry P. Clarke was associated with the School for many years, first as a student and then as an Instructor. He was an expert in the field of recreational games and possessed the rare ability which enabled him to teach equally well games adapted to children of primary age, and games which were suitable for college students.

Limitations of space will not permit detailed statements concerning many others who, during shorter periods of time, rendered valuable service to the School, but hundreds of former students will testify to the skill of such teachers as Francis Dohs, Dr. George L. Meylan, Emmet D. Angell, Fanny Faulhaber, J. Leonard Mason, Susan Hoffman Gilman, Dr. Frederick W. Maroney, Emil Rath, Dr. Louis R. Burnett, Sydney Parsons, Oliver L. Hebbert, Everett M. Sanders, George J. Altmann, Elizabeth E. Andrews, Ralph Shafer, Adolph W. Samborski, Sally Biggane, and Robert M. Smith. Doubtless there are others, equally worthy of mention, whose names have escaped the memory of the writer.

As previously intimated, from its beginning in 1887 until its close in 1932 this School offered a balanced program including instruction in formal gymnastics, athletics, recreational games, and dancing. During the past twenty years there has been a growing tendency in schools and colleges to over-emphasize the importance of recreational games at the expense of gymnastics but the pendulum is beginning to swing backward. As once more the country moves on to a war basis it is becoming increasingly evident that formal gymnastics provide the most effective method for improving the physical condition of the poorly developed boy. If the present crisis continues for any length of time we may expect to find a more sympathetic appreciation of the value of the well-rounded program of exercise which was taught at the Harvard Summer School for more than forty years.

Although many of those who served on the teaching staff of the School are no longer alive and ten years have passed since its

last session came to a close—although the building in which it was housed for so many years has been taken down to make room for the Littauer Center of Public Administration and a new Hemenway Gymnasium now stands on a different site—yet the influence of the School lives on because of the foundations which it helped to build in a new field of education. When we attempt to measure the extent of the influence which this School exerted upon the development of physical education in America, the important factors to keep in mind are, not the number of the years of its life, but rather the particular period of history within which those years were lived—not the size of its annual registration, but rather the geographical distribution represented by that registration—not the total number of individuals enrolled in its student body, but the positions which those individuals held in colleges, secondary schools, public schools, normal schools, and miscellaneous organizations. During its life of more than three hundred years Harvard University has rendered many services of great value to the community—not least in the list of these services is the contribution which was made to the physical welfare of the American people by the Harvard Summer School of Physical Education.

APPENDIX

Annual Registration

1887	57	1903	165	1919	200
1888	45	1904	134	1920	233
1889	59	1905	150	1921	284
1890	83	1906	127	1922	321
1891	95	1907	125	1923	311
1892	111	1908	158	1924	351
1893	56	1909	160	1925	316
1894	77	1910	170	1926	285
1895	90	1911	186	1927	265
1896	104	1912	222	1928	228
1897	124	1913	223	1929	191
1898	84	1914	230	1930	178
1899	72	1915	215	1931	149
1900	119	1916	218	1932	99
1901	111	1917	190		
1902	130	1918	179		

Average Annual Registration By Decades

1887 - 1896	77
1897 - 1906	121
1907 - 1916	190
1917 - 1926	267
1927 - 1932	185

Totals

Total annual registration	7680
Total registration of individuals	5086
Total of Full Certificates issued	698
Total candidates for Master's Degree	152
Total candidates awarded Ed. M.	51

SCHEDULE FOR 1906

Hour	*First Year*	*Second Year*	*Third Year*	*Fourth Year*
9-10	Histology	Physiology	Physiology of Exercise History of Education	Psychology Philosophy of Exercise
10-11	Anatomy	Applied Anatomy Anthropometry	Massage Construction & Equipment Nomenclature	Physical Diagnosis Special Lectures
11	Fencing	Clubs	Games Figure Marching Marching Tactics	Marching Tactics Games
11:20	Clubs	Fencing	Apparatus (men) Apparatus (women)	Apparatus (men) Apparatus (women)
11:40	Calisthenics Marching Tactics	Fancy Steps Bounding Balls	Apparatus (men) Swedish	Military Drill Apparatus (men)
12	Wands Dumb-bells	Wands Dumb-bells	Clubs	Fencing
12:20	Apparatus (men) Swedish (women)	Apparatus (men) Apparatus (women)	Fencing	Clubs
12:40	Apparatus (men) Apparatus (women)	Apparatus (men) Swedish (women) Games (women)	Wands Bar-Bells	Special
2:30	Aesthetic Dancing Foot Ball	Voice Training Foot Ball	Foot Ball	Aesthetic Dancing Foot Ball
3	Voice Training	Aesthetic Dancing	Aesthetic Dancing	
3:30	Track Athletics (women) Boxing, Wrestling (men)	Track Athletics (women) Boxing, Wrestling (men)	Track Athletics (women) Boxing, Wrestling (men)	Track Athletics (women) Boxing, Wrestling (men)
4:30	Hockey, Tennis (women) Track Athletics (men)	Hockey, Tennis (women) Track Athletics (men)	Hockey, Tennis (women) Track Athletics (men)	Hockey, Tennis (women) Track Athletics (men)

SCHEDULE FOR 1910

Hour	*First Year*	*Second Year*	*Third Year*	*Fourth Year*
9-10	Anatomy	Physiology	Physiology of Exercise History of Physical Education	Medical Gymnastics
10-11	Histology	Applied Anatomy Anthropometry	Physical Diagnosis Construction & Equipment	Special Lectures Methods of Teaching Philosophy of Education
2-3		First Aid Special Lectures	Massage Prescription	
11	Fencing	Clubs, T.Th.S.	Games, M.W.F.	Marching Tactics, M.W.F.
11:20		Swedish, M.W.F.	Marching Tactics, T.Th.S.	Games, T.Th.S.
11:25-	Clubs, M.W.F.	Fencing	Apparatus (men)	Apparatus (men)
11:45	Swedish, Tumbling, T.Th.S.		Apparatus (women)	Apparatus (women)
11:50-	Calisthenics, M.W.F.	Fancy Steps, T.Th.S.	Swedish	Military Drill, T.Th.S.
12:10	Marching Tactics, T.Th.S.	Bounding Balls, M.W.F. Tumbling	Tumbling, T.Th.S.	Games,M.W.F.
12:15-	Wands, T.Th.S.	Wands, T.Th.S.	Clubs, M.W.F.	Fencing, M.W.F.
12:35	Dumb-bells, M.W.F.	Dumb-bells, M.W.F.	Wands, T.Th.S.	Clubs, Tu. Th.
12:40-	Apparatus (men)	Apparatus (men)	Fencing	Clubs, M.W.F.
1	Apparatus (women	Apparatus (women)		Special, T.Th.
2:30-3	Dancing	Voice Training		Dancing
3-4	Football	Football	Football	Football
3-3:30	Voice Training.	Dancing	Dancing	
3:30-4:30	Athletics (women)	Athletics (women)	Athletics (women)	Athletics (women)
4-4:30	Boxing, Wrestling (men)	Boxing, Wrestling (men)	Boxing, Wrestling (men)	Boxing, Wrestling (men)
4:30-5	Games	Games	Games	Games
5-6	Hockey, Tennis (women) Track Athletics (men)	Hockey, Tennis (women) Track Athletics (men)	Hockey, Tennis (women) Track Athletics (men)	Hockey, Tennis (women) Track Athletics (men)

SCHEDULE FOR 1915

Hour	*First Year*	*Second Year*	*Third Year*	*Fourth Year*
8-9	Playground	Playground	Playground	Playground
9-10	Anatomy	Physiology	Physiology of Exercise	Preventive Medicine
10-11	Histology	Anthropometry	Mind and Body	Physical Diagnosis Methods of Teaching
2-3	First Aid History of Physical Education	Applied Anatomy	Massage Principles of Education	Prescription
11-	Fencing	Clubs, T.Th.S.	Games, M.W.F.	Marching Tactics
11:20		Swedish, M.W.F.	Marching Tactics, T.Th.S.	Games, T.Th.S.
11:25-	Clubs, M.W.F.	Fencing	Apparatus (men)	Apparatus (men)
11:45	Swedish, Tumbling, T.Th.S.		Apparatus, (women)	Apparatus, (women)
11:50-	Calisthenics, M.W.F.	Fancy Steps, T.Th.S.	Swedish	Folk Dancing, T.
12:10	Marching Tactics, T.Th.S.	Bounding Balls, M.W.F. Tumbling, M.W.F.	Tumbling, T.Th.S.	Games, M.W.F.
12:15-	Wands, T.Th.S.	Wands, T.Th.S.	Clubs, M.W.F.	Fencing, M.W.F.
12:35	Dumb-bells, M.W.F.	Dumb-bells, M.W.F.	Wands, T.Th.S.	Clubs, T.Th.
12:40-	Apparatus (men)	Apparatus (men)	Fencing	Clubs, M.W.F.
1	Apparatus (women)	Apparatus (women)		Special, T.Th.
3-4	Track Athletics (men)	Track Athletics (men)	Track Athletics (men)	Track Athletics (men)
3-3:30	Aesthetic Dancing	Aesthetic Dancing	Aesthetic Dancing	Aesthetic Dancing
3:30-4:30	Track Athletics (women)	Track Athletics (women)	Track Athletics (women)	Track Athletics (women)
4-4:30	Boxing, Wrestling (men)	Boxing, Wrestling (men)	Boxing, Wrestling (men)	Boxing, Wrestling (men)
4:30-5:30	Football (men)	Football (men)	Football (men)	Football (men)
4:30-5	Games	Games	Games	Games
5-6	Hockey, Tennis (women)	Hockey, Tennis (women)	Hockey, Tennis (women)	Hockey, Tennis (women)
5:30-6	Athletic Dancing (men)	Athletic Dancing (men)	Athletic Dancing (men)	Athletic Dancing (men)

SCHEDULE FOR 1924

Hour	*First Year*	*Second Year*	*Third Year*	*Fourth Year*
9:00	Anatomy	Examinations	Physiology of Exercise	Hygiene
10:00	Physiology	Applied Anatomy	Play in Education	Administration
11:00	History of Phy. Ed.	Psychology	Prescription	Principles of Education
*12:00	Athletic Coaching Courses.	Football (M); Basketball	(W); Track (W).	
2:15	Floor Work	Apparatus	Games	Aesthetic Dancing Boxing (M)
2:50	Apparatus	Floor Work	Folk Dancing Tumbling (M)	Corrective Exercise
†3:25	Games	Aesthetic Dancing Tumbling (M)	Floor Work	Apparatus *Basketball Coaching (M)
†4:00	Folk Dancing	Games	Aesthetic Dancing Wrestling (M)	Floor Work *Baseball Coaching (M)
*4:35	Athletic Coaching Courses.	Track (M); Hockey (W);	Tennis, M.W.F.; Soccer, Tu. Th; Swimming	

*Open to all students. M — Men. W — Women.

†Classes scheduled at 3:25 and 4:00 will meet on Monday, Wednesday, and Friday. On Tuesday and Thursday the two periods will be devoted to athletic practice in connection with the coaching courses.

Geographical Distribution
(By individuals)

Alabama	34	Ohio	279
Arizona	5	Oklahoma	16
Arkansas	14	Oregon	10
California	57	Pennsylvania	482
Colorado	21	Rhode Island	172
Connecticut	116	South Carolina	22
Delaware	11	South Dakota	7
District Columbia	133	Tennessee	32
Florida	16	Texas	32
Georgia	48	Utah	24
Idaho	4	Vermont	40
Illinois	231	Virginia	75
Indiana	66	Washington	19
Iowa	59	West Virginia	19
Kansas	58	Wisconsin	76
Kentucky	31	Wyoming	3
Louisiana	10	Hawaii	2
Maine	140	Philippine Islands	3
Maryland	125	Porto Rico	6
Massachusetts	1269	Argentina	1
Michigan	90	Austria	1
Minnesota	78	Bulgaria	1
Mississippi	10	Canada	146
Missouri	81	China	5
Montana	6	Cuba	11
Nebraska	18	England	6
New Hampshire	87	Germany	1
New Jersey	189	Japan	4
New Mexico	2	Panama	1
New York	511	Poland	1
North Carolina	62	Spain	2
North Dakota	4	Turkey	1

Motor Fitness Tests for Farm Boys

By D. M. HALL, *College of Agriculture*
and J. R. WITTENBORN, *College of Liberal Arts and Sciences*
University of Illinois

HEAD, hand, heart, and health—the 4-H's—have long been the major objectives of 4-H Club work and like many other educational objectives they have not been subjected to extensive measurement. In this study a segment of the health area dealing with physical fitness was selected in hopes that tests might be standardized for use in measuring year-to-year progress.

Four tests previously reported [1, 2] *as having significance in appraising physical fitness were used and portable equipment for testing was set up during 1941 in four summer camps for 4-H Club boys. Five adults administered the tests as the boys were rotated among them.

Growth and development of children is a highly complex phenomenon. The rate of growth varies at different periods in life and discussions of height-weight tables give evidence that height and weight are specific for each body type.[3] Likewise it was expected that strength would be found related to body build;[4] consequently each boy's physique was determined according to Wetzel's grid.[6] The number and per cent of boys in each physique channel are shown in Table I.

TABLE I

WHAT ARE THE BODY BUILDS OF 4-H CLUB BOYS?

Physique Channel*	Number	Per cent
A_4 9 Obese	13	3.9
A_3 8 Fat	11	3.7
A_2 7 Stocky	25	7.9
A_1 6 Good	39	12.1
M 5 Good	95	28.2
B_1 4 Good	85	25.4
B_2 3 Fair	32	10.0
B_3 2 Borderline	23	7.3
B_4 1 Poor	5	1.5
Total	328	100

*Physique classes were determined from Dr. Norman C. Wetzel's Grid for Evaluating Physical Fitness[7].

Wetzel designated physique channels as A_4 to B_4. We used 9 to 1 merely for ease in statistical manipulation.

Wetzel suggests that boys in physique class 9 may be in need of medical advice regarding their diet or their endocrine system. Boys

* Superior figures refer to Bibliography at end of article.

in classes 2 and 8 may be considered normal unless there is other evidence that progress is not uniform. Boys in classes 1 and 2 should be further examined for defective diets, dental caries, tonsils, adenoids, fatigue, or poor hygiene. Accordingly, Table I indicates that about 13 per cent of the 4-H boys measured should receive some sort of medical attention.

On most of the tests the boys in physique channel 7 scored the highest. The average score and its standard deviation are shown in Table II.

TABLE II

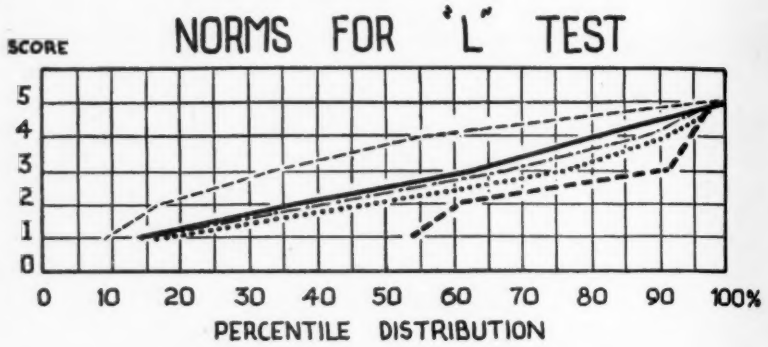
WHAT WAS THE AVERAGE SCORE ON EACH OF THE TESTS FOR EACH PHYSIQUE CLASS?

Physique Classes	No. of boys	Average 'L' test	Average chins	Average push-ups	Average jumps Inches	Average jumps Pounds
9	13	2.0±.36	.61± .33	.8± .24	9.1±.68	68.6±4.4
8	11	2.5±.47	4.0 ±1.3	4.1±1.0	14.1±.47	85.4±6.4
7	25	3.2±.28	5.2 ± .06	5.8±1.0	15.2±.11	82.8±5.0
6	39	3.0±.22	5.0 ± .67	5.3± .68	13.6±.78	73.1±3.9
5	95	3.1±.14	5.6 ± .38	4.9± .40	13.6±.49	72.1± .22
4	85	2.9±.14	5.0 ± .08	4.6± .42	13.7±.48	68.7± .22
3	32	3.2±.25	4.8 ± .58	3.4± .29	13.3±.74	67.4±1.2
2	23	2.6±.12	4.4 ± .70	2.2± .42	14.5±.69	67.4±3.6
1	5	2.4±.63	2.8 ±1.6	.8± .38	10.2±.97	59.4±5.4

The standard error[5] (page 3) was calculated as $\sqrt{\frac{SX^2 - (SX)^2/N}{N(N-1)}}$

Curves showing the distribution of scores on each test for the different physique classes were much alike except for classes 1 and 9. In general the curves for classes 2, 3, 7, and 8 had shorter tails at the maximum end. Due to the similarities in the distributions, all the data for 310 boys classified as physique types 2 to 8 were combined and are shown as the near normal physique curves of figures 1, 2, and 3. Thirteen boys in class 9 are shown by the obese physique curves in these figures.

"Chins" and "push-ups" were designed to test endurance and agility in shoulder and arm muscles. "Chins" had been practiced previously by about 25 per cent of the boys and this may account for the high scores at the 98th percentile. "Push-ups" from the parallel bars had not been practiced. When this test was scored, 1 for "the jump to the bars" and 1 additional point for each complete push-up as Larson had directed,[2] a sharp break in the curve was shown at the 0 and 1 point. Consequently it was decided to begin the count with the first complete push-up and this method gave the curves of figure 2. It is interesting to note that 8 per cent of the 318 boys could not get up onto the bars and that 20 per cent could do no more than stand there on their hands after being boosted into position.



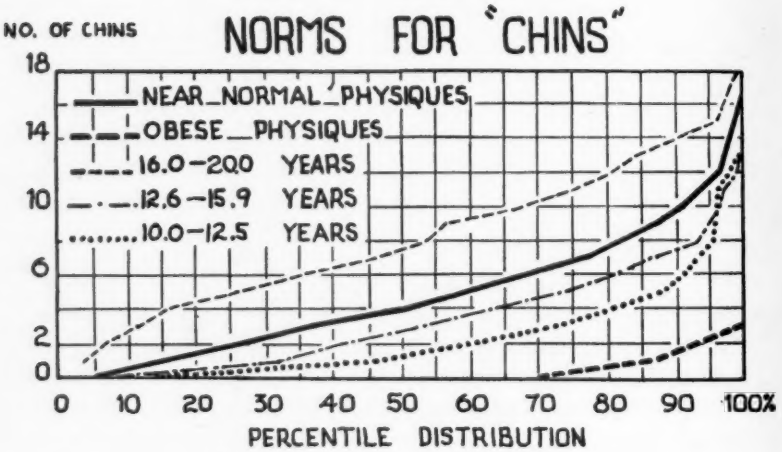


FIG. I. Tentative Test Norms.

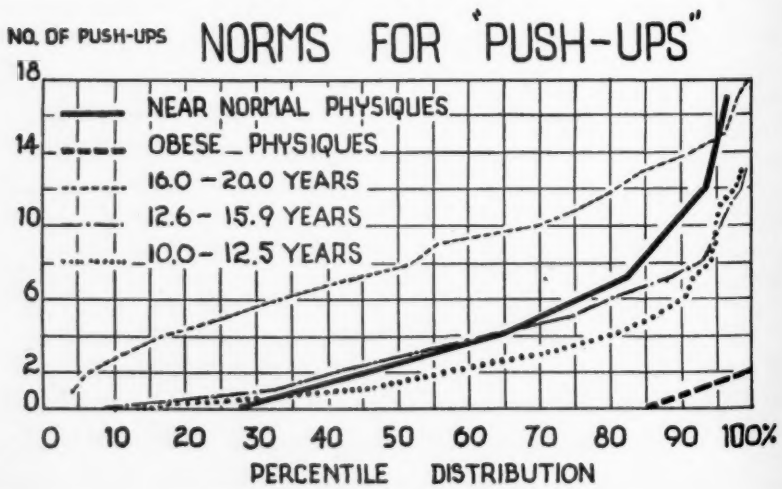


FIG. II. Tentative Test Norms.

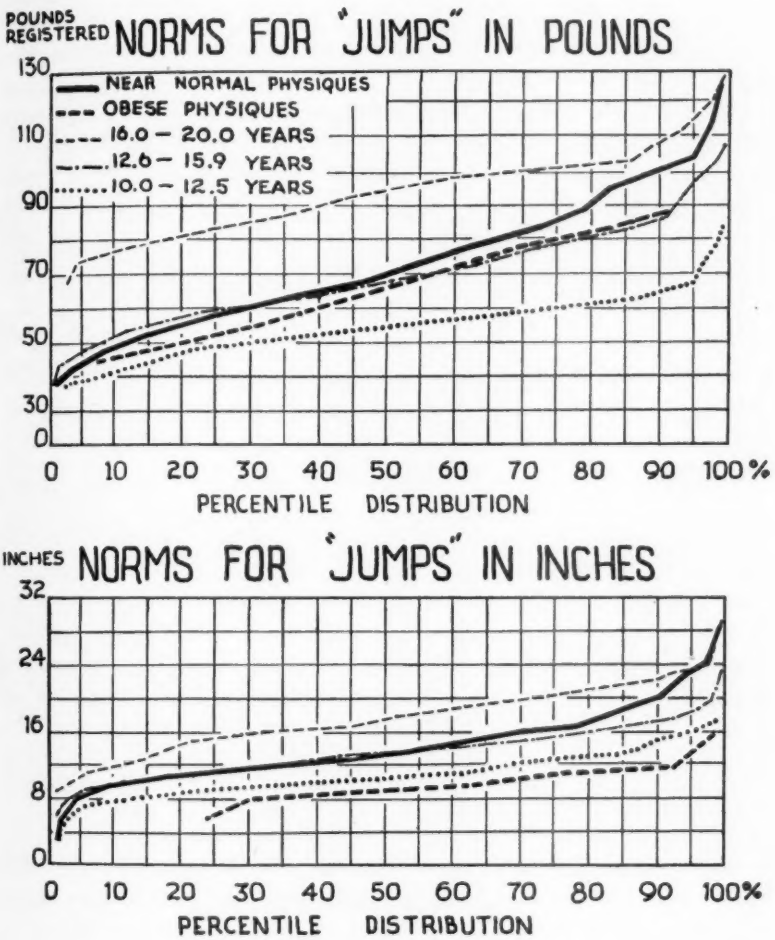


FIG. III. Tentative Test Norms.

"Jumps" was designed to test the leg muscles. Presumably it is a test of the body ability to develop power in relation to body weight in that the weight of the body is hurled through a certain vertical distance. It was thought that "jumps" measured in inches failed to take into consideration the body weight that was hurled upward. Consequently, a record of the pounds exerted downward on the platform of a Toledo scale was made in order to correlate that measure with the inches jumped. (See Appendix.) The product moment correlation coefficient between inches and pounds for 338 boys on this test was 0.65. Records were obtained on 103 boys for 3 trials on two successive days. These data were thrown into an analysis of variance,[5] the results of which are shown in Table III.

TABLE III

How Do Measures of "Jumps" in Inches and Pounds Compare in Reliability?

Source of variation	Degrees of freedom	Variation[2]	Variance	F
Analysis of variance of "jumps" as measured in vertical inches jumped.[1]				
Between days	1	1299	1299	4.0*
Between trials	2	1692	846	2.6
Unexplained	614	199502	324	
Total	617	202493		
Analysis of variance of "jumps" as measured by difference in pounds, still weight, and at instant of leap off.[1]				
Between days	1	1	1	.07
Between trials	2	34	17	1.2
Unexplained	614	8341	13.5	
Total	617	8376		

[1]Three trials on each of 2 days by 103 boys.
[2]Variation is synonymous with sum of squares.
*Level of significance above .05 but under the .01 level.

A comparison of the "F" values in Table III shows a greater than chance variation in the test between the two days when the scores were measured in inches, but not when measured in pounds. Consequently we looked for the source of unreliability in the fact that the boys had learned to increase their score by squatting a bit as they reached to make their first mark. They were frequently cautioned to "stretch higher" because they were not stretching to their maximum.

Jumps measured in inches is the easier procedure but the less reliable test. When careful measurements are desired the scales appear to be the better device. It is more discriminative, as can be seen by the slope of the curve in Figure 3.

Although this study was designed to develop norms for measuring the strength of farm boys it was hoped to secure data to determine the value of certain activities for muscle conditioning. The boys had taken some part in a large number of sports and chores as is shown in Table IV. The number of boys receiving each score on each test was counted, and the per cent of boys in each score class that participated in each of the activities listed in Table IV was determined. For instance, of 32 boys who could not chin themselves, 53.1 per cent indicated they could swim. Likewise, 57.1 per cent of those who chinned themselves once could swim, and 82.3 per cent of those who chinned twice could swim. But as the number of chins was increased, the per cent that could swim varied greatly. If swimming contributes to the ability to chin, we would expect an increas-

ing number of boys to be able to swim as the number of chins increased. When these percentages were correlated (Pearson *r*) with the scores received, little or no relationship was found. Since so little relationship was found for those activities whose distributions appeared to be correlated with motor skill it was thought not worth while to calculate the others.

TABLE IV

IS THERE ANY RELATION BETWEEN PER CENT OF BOYS TAKING PART IN AN ACTIVITY AND THE SCORES RECEIVED ON MOTOR TESTS?

	Boys taking part in each activity		Correlation between the per cent of boys participating in each activity and the score on tests			
Activity	Number	Per Cent	Chins	Push-ups-	"L" Test	Jumps
Baseball	207	62.7		.53		.29
Basketball	107	51.7	.44	.53		.28
Boxing	73	22.1	.57	.36	.63	
Football	60	18.1				
Horseshoes	77	23.3				.23
Swimming	211	63.9	—.03	.19	.81	—.23
Shuffleboard	19	5.7				
Table tennis	105	31.8				
Tennis	47	14.2			.95*	
Wrestling	95	28.7	—.51	—.33	—.24	—.83*
Chinning	83	25.1	.64*	—.14	.93*	
Darts	42	12.7				
Skin-the-cat	46	13.9			.89*	
Weight lifting	73	22.1				
Pitching hay	207	62.7	.55	.55	.76	.49*
Milking	248	75.1	.43	.47		
Chopping wood	152	46.0	.47	.47	.82	
Spading	184	55.7	.46	.46	.89*	.54*
Hoeing, raking	246	74.5				
Operating tractor	211	63.9	.50			
*5% level of significance			.63	.63	.88	.48

These tests may be better understood if they could be described in terms of health factors. For that reason a factor analysis of the more significant data was undertaken. The fifteen variables shown in Table V were analyzed and it was discovered that the intercorrelations could be accounted for in terms of four independent factors, to wit:

FACTOR I. DISEASE SUSCEPTIBILITY

		Factor Loadings
12	Measles	.643
13	Whooping cough	.722
15	Chicken pox	.555
26	Mumps	.534

FACTOR II. PHYSICAL DEVELOPMENT

		Factor Loadings
H	Physique	.630
K	Developmental schedule	.846
L	Growth advancement	.761

FACTOR III. SIZE - AGE

		Factor Loadings
A	Age	.810
D	Weight	.837
I	Height	.826
E	Jumps in inches	.803

FACTOR IV. DYNAMIC STRENGTH

		Factor Loadings
B	"Chins"	.838
C	"L test"	.668
F	"Push-ups"	.747

TABLE V

What Was the Correlation Between the Different Variables?

		Intercorrelation coefficients														
		11	12	13	15	26	A	B	C	D	E	F	H	I	K	L
Scarlet fever	11															
Measles	12	.300														
Whooping cough	13	.275	.465													
Chicken pox	15	.075	.430	.320												
Mumps	26	.162	.327	.520	.240											
Age	A	—.033	—.044	.176	.017	.092										
"Chins"	B	—.034	—.171	.139	—.063	.027	.577									
"L test"	C	—.044	—.223	.041	—.203	—.009	.410	.598								
Weight	D	.062	.232	.298	.149	.283	.738	.341	.022							
"Jumps" in inches	E	.112	—.035	.153	—.036	.144	.776	.492	.391	.826						
"Push-ups"	F	.009	—.050	.030	—.030	.001	.560	.749	.523	.356	.468					
Physique	H	.141	.087	.025	—.072	.130	.025	—.124	—.063	.415	—.163	—.299				
Height	I	.084	.024	.145	.070	.066	.791	.404	.263	.808	.785	.351	—.091			
Development	K	.198	.098	—.012	—.082	.146	.048	—.138	—.057	.570	.359	—.055	.498	.368		
Growth	L	.139	.120	—.022	—.050	.130	—.064	.271	—.150	.454	.177	—.210	.441	.312	.816	

Tetrachoric coefficients were calculated between variables coded 11 to 26.
Bi-serial coefficients were calculated between variables coded 11 to 26 and A to L.
Product moment coefficients were calculated between variables coded A to L.

The four factors were extracted by the Centroid method.[6] These were rotated orthogonally by the graphic method to a position which satisfies the criteria of unique simple structure.[6] Table VI gives the rotated factor matrix.

Each boy was asked to report on a data sheet his age at the time he contracted any of the diseases listed. Those diseases (scarlet fever, measles, whooping cough, chicken pox and mumps), contracted by a considerable number were used as variables in the factor analysis on the basis of whether the boy had or had not been infected. Scarlet fever did not contribute to any factor. It might be expected that some of the 15 variables would show significant negative correlation with Factor I (see Table VI).

TABLE VI

FACTOR LOADINGS DETERMINED FROM THE ROTATED MATRIX

Variables		Factors I	II	III	IV	h^2
Scarlet Fever	(11)	.257	.273	—.084	.119	.162
Measles	(12)	.643	.272	—.162	—.010	.513
Whooping cough	(13)	.722	.138	—.049	.225	.593
Chicken pox	(15)	.555	.021	—.079	—.025	.315
Mumps	(26)	.534	.285	—.033	.125	.383
Age	A	.186	—.119	.810	.398	.863
"Chins"	B	—.125	.005	.278	.838	.795
"L test"	C	—.199	—.136	.179	.668	.536
Weight	D	.337	.453	.837	.112	1.031
"Jumps" in inches	E	.160	.060	.803	.366	.808
"Push-ups"	F	.006	—.195	.281	.747	.675
Physique	H	—.077	.630	—.001	—.157	.427
Height	I	.185	.118	.826	.239	.787
Development	K	—.162	.846	.333	—.093	.861
Growth	L	—.075	.761	.159	.014	.610

The variables, physique, developmental schedule, and growth advancement are highly correlated with Factor II. Physique was described by Wetzel as body build and he maintains that so long as external and internal conditions remain the same, no deviation from type is to be expected. Advancement ("L") or retardation in growth according to age schedule was calculated from Wetzel's Grid by assigning the index number 100 to equal the normal schedule as described by his 67th per cent curve. For each one-half year deviation from this curve 5 points were added or subtracted. Nearly 11 per cent of the boys were ahead of normal schedule 2 years or more and about 5 per cent were 2 years or more behind schedule. The distribution is shown in Figure 4. (Developmental schedule (K) describes growth advancement in 6 frequency classes. Thus K and L measure growth in slightly different ways.)

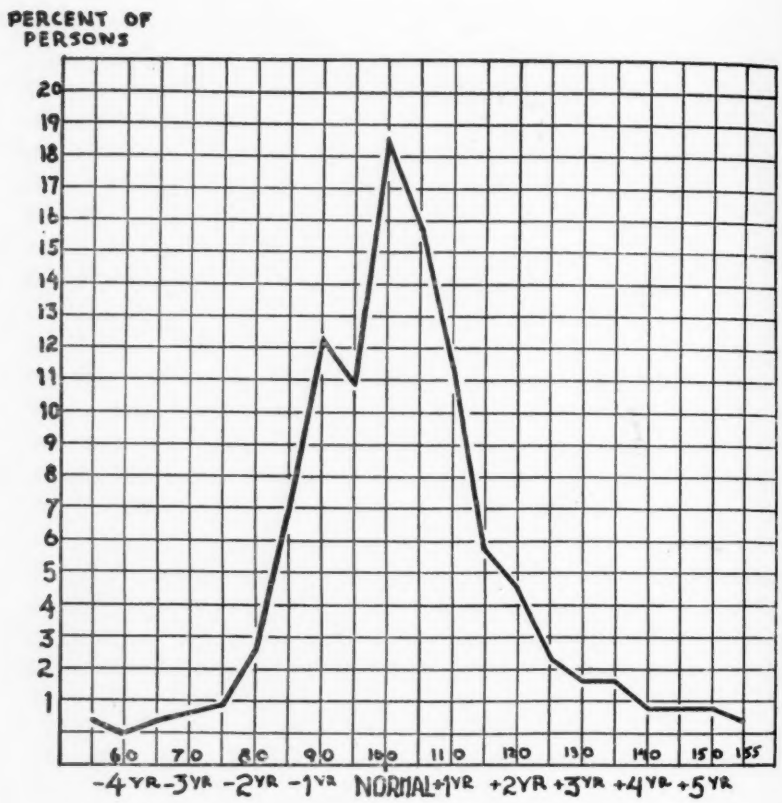


FIG. IV. Distribution of relative advancement and retardation in growth schedule for 328 4-H Club boys, (100 — normal schedule, each 5 points on the scale = .5 of a year above or below normal).

Our original intention was to build norms for physique types, but when it was discovered that the jump test segregated with age in Factor III, it was decided to show norms for this test by age groups. An explanation for age being included in this factor is based upon the natural acceleration in long bone growth that occurs during the pre-adolescent "spurt." It should be noted that age is slightly correlated with Factor IV also.

A retabulation on the basis of an age grouping is as follows:

NUMBER OF BOYS	RANGE IN AGE	MEDIAN AGE
66	10.0-12.5 years	11.0 years
161	12.6-15.9 years	14.0 years
65	16.0-20.0 years	18.0 years

This is the basis for the age norms in Figures 1, 2, and 3.

The age distribution is shown in Table VII.

TABLE VII

WHAT WAS THE AGE DISTRIBUTION OF THE BOYS MEASURED?

Camp	No.	Ave. age	Per Cent Distribution by age										
			10	11	12	13	14	15	16	17	18	19	20
Galesburg	62	14.4		3.2	4.8	19.3	25.3	17.7	13.0	4.8	8.0	3.2	
Bloomington	75	13.5	3.9	14.6	3.9	24.0	14.6	11.9	16.0	2.7	2.7	2.7	2.7
Rockford	90	12.6	12.2	15.5	25.5	22.2	14.4	3.3	2.2	1.1	1.1		2.2
Dixon-Spr.	112	14.5	3.6	8.1	9.9	13.5	17.1	16.2	9.9	13.5	2.7	1.8	4.5

Absolute values of age, weight, and height are expressed in the clustering in Factor III, whereas in Factor II the relative values are shown in that the measures of physique and growth are relationships between weight, height, and age. The loadings for Factors II and III show the most probable relationship existing between the variables, but being based upon correlation coefficients they do not necessarily reveal the reactions of any particular segments of the distribution. The mean values for each physique class shown in Table II lead one to believe that the obese and poor physique segments do react differently from the more nearly normal physiques.

Factor IV is described as dynamic strength of the muscles of the arms, shoulders, back, and abdomen, in that the clustering variables are tests of ability of the muscles of these parts to sustain bodily movement. This factor shows no important correlations with the variables in any other factor.

No explanation is attempted for the lack of correlation between the variables describing children's diseases and those describing muscular power and endurance. It may be that those who were adversely affected by these diseases are not found in 4-H Camps.

The most interesting contribution which factor analysis has made to this study is the fact that dynamic strength seems to be independent of disease and the physical development factor consisting of physique and growth schedule for the population as a whole. Although it is not revealed here, we suspect that the extreme physique classes, obese and poor, may be exceptions to this general lack of relationship. Table II suggests this conclusion and confirms Wetzel's contention. Factor analysis is, of course, subject to the predictive shortcomings peculiar to correlations; one never knows which part of the population is contributing to the co-relationship.

All of the factors are independent of each other with the possible exception of Factors III and IV. When these factors are plotted against each other, it is apparent that each cluster lies within the first quadrant, that is, the variables of Factor III are positively correlated with Factor IV and those of Factor IV are positively correlated with Factor III. If we further apply our rotational principle,

minimizing the number of negative loadings and maximizing the number of zero loadings, we shall pass Factor III through the cluster, B, C, and F, and Factor IV through the cluster D, E, H, and I. If this is done, the correlation between Factors III and IV becomes .446. That the size-age factor and the strength factor should be slightly correlated is not in conflict with opinion. From Table VI it is seen that the variables of Factor IV most highly correlated with Factor III are age and jumps. This conforms with our tentative interpretation of these factors; all other things being equal, older boys tend to be stronger, and it is reasonable also that boys who are stronger should also be the boys who jump higher.

An analysis of the 4th H which stands for health in boys' and girls' club work shows three constituents of physical fitness.

1. Physique. A robust body build, with size in proportion to age, with erect posture, alert appearance, and with bone, muscle, and fat development in balance, enabling the body to stand up under a strenuous day's work.

2. Organic health. The sensory organs, the heart, lungs, digestive and endocrine systems capable of sustained effort.

3. Motor fitness. The capacity for power, strength, endurance, agility, balance, and movement necessary for work, protection and recreation.

The tests used in this project are classed within the motor fitness area. They seem satisfactory as measures of a club program designed to secure improvements in power endurance and agility. They could be supplemented with other tests to test more adequately physical fitness, and if used year after year, would show what progress is made toward attaining the health objective.

APPENDIX

Directions for Administering the Tests

1. *Chins*—A horizontal bar was used at such height that the subject did not touch the ground when in the lowered position. The subject hung freely, then pulled himself up until his chin was above the bar, then lowered himself full arm length. The number of times he chinned was counted but he was not permitted to kick, swing, or rest.

2. *Push-ups*—The subject jumped to arm rest position at the end of parallel bars set at shoulder height. He stood with arms fully extended and from this position lowered himself to a right angle arm bend position. He then pushed his body up to the first position. He was not permitted to kick, swing, or rest. The count began after the boy made his first dip and returned to the arm rest position and one additional count was given for each full dip and return.

3. *Jumps*—A slate blackboard ruled in one inch vertical intervals was erected at a height that could be reached when the subject was standing feet flat on the platform of a Toledo scale, Model 31-1822 with 300-pound dial. He was instructed to wet his fingers in a pail of water and to touch the slate at his maximum reach with one arm extended. The subject was then instructed to squat and jump, touching the slate at the greatest possible height. Records

were made for each of three trials. The difference in inches between the mark made at standing and at jumping positions was recorded. At the same time the difference in pounds shown as still weight and that shown at the "leap-off" was recorded. This difference is equivalent to the force exerted to raise the body through the distance jumped.

4. *"L" test*—The subject was instructed to hang from the horizontal bar and to slowly raise his legs to their greatest height without bending his knees. Readings 1 to 5 were taken at equal intervals between 45° and 90° from the vertical. The scale was adjusted so that the center of the circle was at the hip joint (trochanter).

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The Measurement of General Motor Capacity and General Motor Ability in The First Three Grades

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SINCE the publication of methods of measuring general motor capacity and general motor ability in the upper grades and high school,[8]* these measurements have been shown to be very useful and to measure general motor capacity better than any other current devices.** Since no comparable standards are available for the first three grades, this study was undertaken.

General motor capacity and general motor ability batteries for the upper grades and high school have made use of the Sargent jump, the Burpee test, Brace type tests,[2] a strength test, and several track and field events including a run, a jump, and a throw.[8, 9] These tests were tentatively taken as a starting point. Two preliminary studies were undertaken.

The Classification Index has been recommended as valuable for use with boys throughout the school grades.[9, 10] However, several studies have shown that the same is apparently not true for girls, that a weighted combination of age, height, and weight is no better than age alone as a classifier of girls up to 13½ years and that after that all classifiers are questionable.[1, 5, 9] The Classification Index (McCloy's formula: 20 Age+6 Height+Weight) was computed for each boy and girl. This was then correlated with five outstanding batteries and events. Following are the resulting *r*'s:

Batteries and Events	*Boys*	*Girls*
Shot—C. I.	.7014	.4016
Total arm strength—C. I. (grips, push, pull)	.5884	.4023
Total Points—C. I. (sum of T-scores of 8 events described below)	.6681	.6688
Sargent jump	.4986	.7607
Broad jump	.4802	.4286

* Superior figures refer to Bibliography at end of article.

** Some of the best evidence is given in a study as yet unpublished by Mrs. Theresa Anderson and C. H. McCloy in which general motor capacity scores correlate .82 with five judges' ratings of general motor ability. (Personal communications.)

From these results it was concluded that the C. I. is of value at this age level both for boys and for girls.

From another study, reported in *Child Development,*[8] five Johnson-type tests were selected from a group of fourteen and formulae were presented for weighting them to give a total score for boys and girls. These five† were used in the present study.

A comparable study of the Brace-type tests at the lower age levels is not yet available in the literature. Pending the appearance of such a study a group of Brace-type tests was chosen from those recommended for elementary grades which are readily administered to younger children and which have a fairly good spread of difficulty.

The Sargent jump has been shown to be a good measure of power, or the time rate of work relative to body weight, while the Burpee test is a measure of agility, the ability to change the direction of the body or parts of the body very rapidly. Both of these tests are simple enough to allow sufficient practice so that skill does not enter; hence they combine to make a good measure of physical capacity.

Two forms of motor educability tests are offered in this study. Just as intelligence is sometimes measured by paper and pencil tests taken by all of the children at once or by tests such as the Stanford-Binet taken individually, so motor educability tests such as the Brace type can be given to groups more quickly, although it is dubious if children at these ages can score each other, or by the Johnson-type tests which are taken individually and so are slower but probably more accurate.

Records were obtained for 117 boys and 100 girls of the first three grades. Included for each individual are:

Age, height and weight	Run and under
Right and left grips	Run and over
6 Brace-type tests	Run and sit
5 Johnson-type tests	Hop
Sargent jump	30-yard dash
Burpee test	24″ (circumference) ball throw
Standing broad jump	4-pound shot-put**

The reliability of the strength tests, right and left grips, push and pull, has been demonstrated in previous studies. The nature of the Brace-type and Johnson-type tests precludes an accurate check on reliabilities for such a study as this because of the fact that different speeds of learning affect the results of repetitions of the tests. The remainder of the tests showed the following reliabilities:

† Descriptions of these tests, Johnson-type with formulae, and Brace-type, will be found in the appendix.

** Descriptions of these tests will be found in the appendix.

	Boys	*Girls*
Run and under	.5500	.5709
Run and over	.5791	.6577
Run and sit	.5653	.5979
Hop	.7097	.6933
Dash	.6715	.7049
Ball throw	.9631	.8696
Shot	.8547	.8228
Broad jump	.7984	.8027
Sargent jump	.9036	.9105
Burpee test	.6707	.8109

The eight events, run and over, run and under, run and sit, broad jump, hop, dash, throw, and shot were T-scored and the total of the eight T-scores was added for each individual. The sum of these eight T-scores was called "Total Points" and was used as a criterion of motor ability throughout the study.

Previous studies have shown that a combination of track and field events with some strength tests have been the best bases for rating general motor ability. For this age level, of the track and field events, shot and broad jump correlated best with strength. These two and weight also correlated well with Total Points.

	Boys	*Girls*
Broad jump—T.P.	.7003	.7374
Shot—T.P.	.7042	.6055
Weight—T.P.	.5641	.5155

For girls the three gave a multiple *R* of .8443 with Total Points, for boys an *R* of .8207 so they were selected as the battery on which to base the General Motor Ability Score, G.M.A.S.

On the basis of multiple regression equations the following formulae were computed.

Girls: G.M.A.S. = 4.8433 Broad jump + 7.6760 Shot + .2461 Weight + 114.82.

which was simplified to:

= 1 Broad jump + 1.5 Shot + .05 Weight (Formula No. 2)

Boys: G.M.A.S. = 2.5770 Broad jump + 6.4611 Shot + 1.1828 weight + 144.65

which was simplified to:

= 2 Broad jump + 2.5 shot + .5 weight (Formula No. 3)

For general motor capacity the tests used for the upper grades were tentatively selected for use with the lower grades. Two types of educability batteries, the Brace and the Johnson, were studied. By the term "Brace" is meant the group of six stunt tests of the type Brace[2] recommended. "Johnson" refers to the group of five tests of the general type recommended by Johnson.[6] "Brace" and "Johnson" will hereafter be used to designate these two batteries.

Because the Classification Index was shown to be significant at this age level for both sexes, it was included in each battery.

For girls, Sargent jump, Burpee,†† Brace, and C. I. when correlated with Total Points gave a multiple R of .7281. When Sargent, Burpee, and Brace were correlated with Total Points, the multiple R was only .5646 so it was decided to keep C. I. in the battery because it is of obvious importance.

From a multiple regression equation the following formula was computed for the prediction of general motor capacity for girls:

G.M.C.S.B = .9786 Sargent jump + 9.1234 Burpee + 5.6904 Brace + .7179 C.I. — 56.33

However, it seemed desirable to arrange this so that the G.M.C.S. would at the same time be the norm for the G.M.A.S. in order to obtain for each individual a General Motor Achievement Quotient which would tell how good an individual is in relation to how good he is capable of being. In order to do this the G.M.C.S. was computed for each individual according to the above formula. These scores were then correlated with the G.M.A.S. scores (formula No. 2) giving an r of .5056. Based on this the norm for the G.M. A.S. would be: Norm = .1081 G.M.C.S.B. + 15.54.

In order to simplify this the G.M.C.S.B. formula was put into the regression equation and from this was derived a modified formula which gives the G.M.C.S.B and at the same time is the norm for the G.M.A.S. from which the General Motor Achievement Quotient can be computed.

G.M.A.S. norm } = .1081 (.9786 Sargent jump + 9.1234 Burpee + 5.6904
G.M.C.S.B } Brace + .7179 C.I. — 56.33) + 15.54

When simplified this becomes:

G.M.A.S. norm } = .1058 Sargent jump + .9862 Burpee + .6151 Brace +
G.M.C.S.B } .0776 C.I. + 9.45 (Formula No. 4)

Tables I—IV are given to aid in computing this score.*

This score was computed for each girl, then correlated with her C. I., giving an r of .8865. The formula derivevd from this from which the norm for the G.M.C.S.B can be computed is: Norm=.0968 C. I. + 11.27 (Formula No. 5). Table V is given to aid in the computation of this norm.

In order to determine the individual's M. Q. or Motor Quotient her G.M.C.S.B x 100 is divided by her norm. If the resulting M. Q. is below 100 she will probably need more instruction, more practice, and should not be expected to achieve the levels of those having better innate equipment.

†† The term "Burpee" is used throughout the study to designate the agility test developed by Royal H. Burpee.

* Tables will be found in the Appendix.

This process was repeated with the Johnson-type tests in the battery in place of the Brace-type group.

For girls, Sargent jump, Burpee, Johnson, and C. I. gave a multiple R of .7210 with Total Points. Sargent jump, Burpee, and Johnson gave a multiple R of .6235 with Total Points. Here again is demonstrated the importance of the C. I. for this group.

From a multiple regression equation the following formula was derived for the G.M.C.S.J for girls:

1.2568 Sargent jump + 9.5846 Burpee + .8868 Johnson + .7210 C.I. — 36.49

This was computed for each girl and correlated with G.M.A.S. giving an r of .5104. The norm for the G. M. A. S. from which the General Motor Achievement Quotient can be computed would then be: Norm = .1173 G.M.C.S.J + 11.13.

In order to simplify this the G.M.C.S.J formula was put into the formula for the norm:

G.M.A.S. norm / G.M.C.S.J = .1173 (1.2568 Sargent jump + 9.5846 Burpee + .8868 Johnson + .7210 C.I. — 36.49) + 11.27

This when multiplied becomes:

G.M.A.S. norm / G.M.C.S.J = .1474 Sargent jump + 1.1243 Burpee + .1042 Johnson + .0846 C.I. + 6.85 (Formula No. 6)

The computation of this formula may be facilitated by use of Tables VI—IX.

This score was then computed for each girl and correlated with her C. I., giving an r of .9066. The norm for the G.M.C.S.J from which the M. Q. can be computed would then be: G.M.C.S.J norm= .1064 C. I.+6.83 (Formula No. 7). Table X is given for aid in determining this norm.

The same procedure which was followed with the girls' records was followed with the boys. The Brace-type tests were included in one battery, the Johnson-type tests in the other.

Sargent jump, Brace, Burpee, and C. I. gave a multiple R of .7398 with Total Points. Sargent jump, Burpee, and Brace gave a multiple R of .6434 with Total Points. C. I. is of obvious importance.

From a multiple regression equation the following formula was derived for determining the G.M.C.S.B for boys:

2.7339 Sargent jump + 10.1696 Burpee + 1.7851 Brace + .5497 C.I. + 7.66

This was computed for each boy and the resulting scores were correlated with the boys' G.M.A.S. scores (formula No. 3), giving an r of .7437. The norm for the G.M.A.S. would then be: Norm = .4966 G.M.C.S.B—47.45.

In order to simplify this, the G.M.C.S.B formula was put into the above formula:

G.M.A.S. norm / G.M.C.S.B = .4966 (2.7339 Sargent jump + 10.0696 Burpee + 1.7581 Brace + .5497 C.I. + 7.66) — 47.75

This when multiplied out becomes:

G.M.A.S. norm } = 1.3577 Sargent jump + 5.0006 Burpee + .8731 Brace
G.M.C.S.B } + .2730 C.I. — 43.95 (Formula No. 8)

The resulting score is the new G.M.C.S.B and at the same time is the norm for the G.M.A.S. from which the General Motor Achievement Quotient can be computed. Tables XI to XIV are given for aid in computing this score.

In order to determine a norm for the G.M.C.S.B this score was computed for each boy and correlated with his C. I., giving an r of .9308. His norm would then be: .4055 C. I.—49.24 (Formula No. 9). Table XV is given for use in determining this score.

Using the Johnson-type tests in the battery in place of the Brace-type tests a multiple R of .7560 was found between Total Points and Sargent jump, Burpee, Johnson, and C. I. An R of .6810 was found between Total Points and Sargent, Burpee, and Johnson. Here, again, C. I. is shown to be of importance.

From a multiple regression equation the following formula was computed for the G.M.C.S.J for boys:

G.M.C.S.J — 2.6847 Sargent jump + 6.8865 Burpee + .8792 Johnson + .5063 C.I. + 40.64

This was computed for each boy and correlated with his G.M.A.S. (formula No. 3) giving an r of .7474. The norm for his G.M.A.S. would then be: .4951 G.M.C.S.J—47.99.

In order to simplify this the G.M.C.S.J formula was put into the above formula:

G.M.A.S. norm } = .4951 (2.6847 Sargent jump + 6.8865 Burpee + .8792
G.M.C.S.J } Johnson + .5063 C.I. + 40.64) — 47.99

This when multiplied becomes:

G.M.A.S. norm } = 1.3292 Sargent jump + 3.4095 Burpee + .4353 Johnson
G.M.C.S.J } + .2507 C.I. — 27.87 (Formula No. 10)

The score computed according to this formula is the new G.M.C.S.J and at the same time is the norm for the G.M.A.S. from which the General Motor Achievement Quotient can be computed. Tables XVI—XIX are given for aid in computing this score.

In order to determine a norm for the G.M.C.S.J., this score was computed for each of the boys and correlated with C. I. giving an r of .8798. The norm would then be: G.M.C.S.J norm=.4037 C. I.—48.47 (Formula No. 11). Table XX is given for use in determining this norm.

Following are example records, a boy and a girl, showing how the several battery scores are computed and how the norms are used to determine the quotients. The cases are not hypothetical but are drawn from the record cards used in this study.

CASE I

Darlene Age 6-5 Height 48.75 Weight 54.5 C.I. 462

Sargent jump 21
Burpee 4½
Brace 9
Johnson 11
Broad jump 36
Shot 12′

G.M.A.S.

1 Broad jump	36
1.5 Shot	18
.05 Weight	3
G.M.A.S.	57

Norm by G.M.C.S.B = 55.50
G.M.A.Q. = 103
Norm by G.M.C.S.J = 55.25
G.M.A.Q. = 103

G.M.A.S. norm / G.M.C.S.B =

.1058 Sargent		2.22
.9862 Burpee		4.44
.6151 Brace +	9.45	14.99
.0776 C.I.		35.85
		55.50

G.M.A.S. norm / G.M.C.S.J =

.1476 Sargent		3.10
1.1243 Burpee		5.06
.1042 Johnson +	6.85	8.00
.0846 C.I.		39.09
		55.25

Norm for G.M.C.S.B = .0968 C.I. + 11.27 = 55.99
Motor Quotient = $\frac{55.50}{55.99} = 99$

Norm for G.M.C.S.J = .1064 C.I. + 6.83 = 55.99
Motor Quotient = $\frac{55.25}{55.99} = 99$

CASE II

Raymond Age 9-1 Height 51 Weight 57 C.I. 537

Sargent jump 23
Burpee 5¼
Brace 10
Johnson 34
Broad jump 52″
Shot 16′

G.M.A.S. =

2 Broad jump	104
2.5 Shot	40
.5 Weight	29
G.M.A.S. =	173

G.M.A.Q. by G.M.C.S.B = 173
168.86 = 102
G.M.A.Q. by G.M.C.S.J = 173
170.03 = 102

G.M.A.S. norm / G.M.C.S.B =

1.3755 Sargent	31.23
5.0006 Burpee	26.25
.8731 Brace	8.73
.2730 C.I.	146.40
	212.81
	— 43.95
	168.86

G.M.A.S. norm / G.M.C.S.J =

1.3292 Sargent	30.57
3.4059 Burpee	17.90
.4353 Johnson	14.60
.2507 C.I.	134.63
	197.90
	— 27.87
	170.03

Norm for G.M.C.S.B = .4055 C.I. — 49.24 = 168.51
Motor Quotient = $\frac{168.86}{168.51} = 100$

Norm for G.M.C.S.J = .4073 C.I. — 48.47 = 168.32
Motor Quotient = $\frac{170.03}{168.32} = 101$

In view of the fact that very little individualization of program has been practiced in the lower grades it is suggested that some fairly large school system where there are well-trained teachers of physical education in the grades conduct experiments with the upper 30 per cent and the lower 30 per cent, according to their Motor Quotients, of possibly the second grade to see if adapted programs would not be worked out to advantage. It would be interesting and probably extremely important to follow the group up into high school to see what happens. Educators are generally agreed that the so-called smarter children should have special work. What about the groups who are "smarter" in a motor way?

While the use of these tests may not be widespread, they should furnish a basis for much needed further experimentation.

APPENDIX

Directions for tests used in the study:

Right and left grips were taken in the usual manner by means of a hand dynamometer. The children were urged to exert their maximum strength.

Push and pull were taken by means of the hand dynamometer in a push and pull attachment.[9]

The broad jump was taken from a stand and according to standard directions.

The 30-yard dash was taken from a regular start. Score is time in seconds and tenths.

In "run and over" the child runs 25 feet, climbs or vaults over a wooden carpenter's "horse" two feet high and four feet long, turns around the horse and runs back. A running start is used. The score is the time in seconds and tenths from the moment the child crosses the starting line until he recrosses it.

In "run and under" the child runs 25 feet, rolls or scrambles under the wooden "horse" described above, turns arounds the horse and runs back. A running start is used. Scored as above test.

In "run and sit" the child runs 25 feet, sits down on the ground or floor, gets up, turns around and runs back. Start and scoring are the same as the two tests above.

In "hop" the child hops 50 feet on one foot. A standing start is used. Score is the time in seconds and tenths taken to complete the hopping.

The Sargent jump was taken following standard directions and using a wall chart.[9]

The Burpee test was taken according to standard directions.[9]

In the ball throw, the child used a playground rubber ball 24 inches in circumference. He threw from a stand. His record is the best of three trials.

The four-pound shot-put was done according to standard directions from a standing position.

Johnson—Type Tests:[3, 6]

1. *Single hop left.*—(Originally designated as test B.) Hands on hips. Start with feet together behind the first white square on the left. Hop on the left foot onto the first white square, then onto the black square, onto the second white square, and so on down the mat.

2. *Diagonal hop.*—(D) Start with the feet together on the first center target. Hop with the feet together onto the first black square to the right,

then to the second center target, to black square on the left, and so on down the mat.

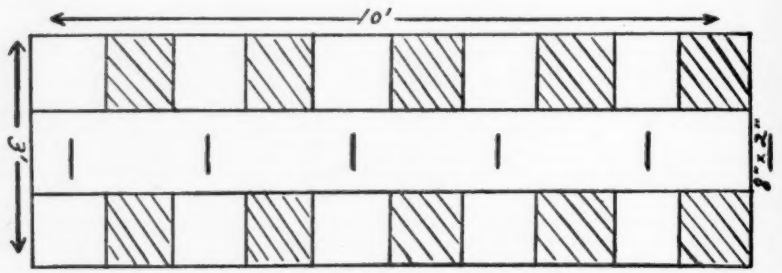
3. *Backward hop right.*—(E) This test is the same as the single hop right except that the child hops backward. Hands on hips. Start with the feet together behind the first white square on the right. Hop backwards onto the right foot onto the first white square, then onto the next black square, the second white square, and so on down the mat.

4. *Left sideward hop.*—(H) Start with the left side toward the mat, left foot on the center target. Hop on the left foot diagonally backward to the first black square, then, still on the left foot, diagonally forward to the second center target, then diagonally forward to the second black square. Proceed thus down the mat.

5. *Right sideward hop.*—(I) This test is the same as the one above except that it is done on the right foot and with the right side toward the finish target.

The tests are scored according to Johnson's directions. Ten is the perfect score from which is subtracted one point if the subject breaks his rhythm, one if he takes his hands off his hips, one for every time he steps over a line or fails to touch the square or center target as directer. He is also penalized a point if he hops forward instead of sideward in tests 4 and 5. If he makes more than ten errors, his score is 0.

Figure I gives the modified mat used for the Johnson-type tests. It can be drawn onto the floor or playground, if hard surfaced, with alabastine, cold water paint.



Formulae for weighting:

Boys: = 1B + 2D + 1E + 1I + 1H
Girls: = 1E + 2D + 1.75H + 1I + .25B

Brace-type tests:

1. *Grapevine.*—Stand with the heels close together, bend down, extend arms between knees, around behind ankles, and hold fingers together in front of ankles for five seconds. It is a failure to lose balance, not to touch and hold the fingers together for five counts, not to hold the position for five seconds.

2. *One knee balance.*—Face to the side. Kneel on one knee with the other leg raised off the floor and arms stretched out at the sides. Hold your balance in this position for five counts. It is a failure to touch the floor with any other parts of the body than the one leg and knee, to lose balance and fall over.

3. *Cross leg squat.*—Fold the arms across the chest and sit down cross legged. Get up without unfolding the arms or having to move the feet around to regain balance. It is a failure to unfold the arms, lose the balance, or be unable to get up.

4. *Full right or left turn.*—Stand with the feet together. Swing the arms and jump into the air making a full right turn to the right or to the left and land on the same spot; do not lose the balance or make it necessary to move the feet after they strike the floor. It is a failure not to make a full turn and land facing in the same direction as at the start, to lose the balance, and to have to step about to keep from falling.

5. *Backward hop.*—Stand on either foot, close eyes, and take five hops backward. It is a failure to open the eyes or drop the other foot.

6. *Kneel, jump to feet.*—Kneel on both knees with side toward partner. Extend the toes of both feet out flat behind. Swing the arms and jump to the feet without rocking back on the toes or losing the balance. It is a failure to have toes curled under and rock back on them, not to execute the jump and stand still on both feet.

The tests are scored according to standard directions; 2, if the child does the stunt correctly the first time; 1, if he fails on first trial but succeeds on second; 0, if he fails two trials. No practice is allowed on either Brace-type or Johnson-type tests.

TABLE I

Girls G.M.C.S.B .1058 Sargent jump

Sargent jump	0, 5	1, 6	2, 7	3, 8	4, 9
35	3.70	3.81	3.91	4.02	4.13
30	3.17	3.28	3.39	3.49	3.60
25	2.65	2.75	2.86	2.96	3.07
20	2.12	2.22	2.33	2.43	2.54
15	1.59	1.69	1.80	1.90	2.01
10	1.06	1.16	1.27	1.38	1.48
5	.53	.63	.74	.85	.95
0	.00	.11	.21	.32	.42

TABLE II

Girls G.M.C.S.B .9862 Burpee

Burpee	0	¼	½	¾
8	7.89	8.14	8.38	8.63
7	6.90	7.15	7.40	7.64
6	5.92	6.16	6.41	6.66
5	4.93	5.18	5.42	5.67
4	3.94	4.19	4.44	4.68
3	2.96	3.21	3.45	3.70
2	1.97	2.22	2.47	2.71

TABLE III

Girls G.M.C.S.B .6151 Brace + 9.45

Brace		Brace	
12	16.83	5	12.53
11	16.22	4	11.91
10	15.60	3	11.30
9	14.99	2	10.68
8	14.37	1	10.07
7	13.76	0	9.45
6	13.14		

TABLE IV

Girls G.M.C.S.B .0776 C. I.

C. I.	0	1	2	3	4	5	6	7	8	9
590	45.78	45.86	45.94	46.02	46.09	46.17	46.25	46.33	46.40	46.48
580	45.01	45.09	45.16	45.24	45.32	45.40	45.47	45.55	45.63	45.71
570	44.23	44.31	44.39	44.46	44.54	44.62	44.70	44.78	44.85	44.93
560	43.46	43.53	43.61	43.69	43.77	43.84	43.92	44.00	44.08	44.15
550	42.68	42.76	42.84	42.91	42.99	43.07	43.15	43.22	43.30	43.38
540	41.90	41.98	42.06	42.14	42.21	42.29	42.37	42.45	42.53	42.60
530	41.13	41.21	41.28	41.36	41.44	41.52	41.59	41.67	41.75	41.83
520	40.35	40.43	40.51	40.58	40.66	40.74	40.82	40.90	40.97	41.05
510	39.58	39.65	39.73	39.81	39.89	39.96	40.04	40.12	40.20	40.27
500	38.80	38.88	38.96	39.03	39.11	39.19	39.27	39.34	39.42	39.50
490	38.02	38.10	38.18	38.26	38.33	38.42	38.49	38.57	38.64	38.72
480	37.25	37.33	37.40	37.48	37.56	37.64	37.71	37.79	37.87	37.95
470	36.47	36.55	36.63	36.70	36.78	36.86	36.94	37.02	37.09	37.17
460	35.70	35.77	35.85	35.93	36.01	36.08	36.16	36.24	36.32	36.39
450	34.92	35.00	35.08	35.15	35.23	35.31	35.39	35.46	35.54	35.62
440	34.14	34.22	34.30	34.38	34.45	34.53	34.61	34.69	34.76	34.84
430	33.37	33.45	33.52	33.60	33.68	33.76	33.83	33.91	33.99	34.07
420	32.59	32.67	32.75	32.82	32.90	32.98	33.06	33.14	33.21	33.29
410	31.82	31.89	31.97	32.05	32.13	32.20	32.28	32.36	32.44	32.51
400	31.04	31.12	31.20	31.27	31.35	31.43	31.51	31.58	31.66	31.74

TABLE V

Girls Norm for G.M.C.S.B .0968 C. I. 11.27

C. I.	0	1	2	3	4	5	6	7	8	9
590	68.38	68.48	68.58	68.67	68.77	68.87	68.96	69.06	69.16	69.25
580	67.41	67.51	67.61	67.70	67.80	67.90	67.99	68.09	68.19	68.29
570	66.45	66.54	66.64	66.74	66.84	66.93	67.03	67.12	67.22	67.32
560	65.48	65.57	65.67	65.77	65.87	65.96	66.06	66.16	66.25	66.35
550	64.51	64.61	64.70	64.80	64.90	64.99	65.09	65.19	65.28	65.38
540	63.54	63.64	63.74	63.83	63.93	64.03	64.12	64.22	64.32	64.41
530	62.57	62.67	62.77	62.86	62.96	63.06	63.15	63.25	63.35	63.45
520	61.61	61.70	61.80	61.90	61.99	62.09	62.19	62.28	62.38	62.48
510	60.64	60.73	60.83	60.93	61.03	61.12	61.23	61.32	61.41	61.51
500	59.67	59.77	59.86	59.96	60.06	60.15	60.25	60.35	60.44	60.54
490	58.70	58.80	58.90	58.99	59.09	59.19	59.28	59.38	59.48	59.57
480	57.73	57.83	57.93	58.02	58.12	58.22	58.31	58.41	58.51	58.61
470	56.77	56.86	56.96	57.06	57.15	57.25	57.35	57.44	57.54	57.64
460	55.80	55.89	55.99	56.09	56.19	56.28	56.38	56.48	56.57	56.67
450	54.83	54.93	55.02	55.12	55.22	55.31	55.41	55.51	55.60	55.70
440	53.86	53.96	54.06	54.15	54.25	54.35	54.44	54.54	54.64	54.73
430	52.89	52.99	53.09	53.18	53.28	53.38	53.47	53.57	53.67	53.77
420	51.93	52.02	52.12	52.22	52.31	52.41	52.51	52.60	52.70	52.80
410	50.96	51.05	51.15	51.25	51.35	51.41	51.54	51.64	41.73	51.83
400	49.99	50.09	50.18	50.28	50.38	50.47	50.57	50.67	50.76	50.83

TABLE VI

Girls G.M.C.S.J .1476 Sargent jump

Sargent jump	0, 5	1, 6	2, 7	3, 8	4, 9
35	5.17	5.31	5.46	5.61	5.76
30	4.43	4.58	4.72	4.87	5.02
25	3.69	3.84	3.99	4.13	4.28
20	2.95	3.10	3.25	3.39	3.54
15	2.21	2.36	2.51	2.66	2.80
10	1.48	1.62	1.77	1.92	2.07
5	.74	.89	1.03	1.18	1.33

TABLE VII

Girls G.M.C.S.J 1.1243 Burpee

Burpee	0	¼	½	¾
8	9.00	9.28	9.56	9.84
7	7.87	8.15	8.43	8.71
6	6.75	7.03	7.31	7.59
5	5.62	5.90	6.18	6.46
4	4.50	4.78	5.06	5.34
3	3.37	3.65	3.94	4.22
2	2.25	2.53	2.81	3.09

TABLE VIII

Girls G.M.C.S.J .1042 Johnson + 6.85

Johnson	0, 5	1, 6	2, 7	3, 8	4, 9
50	12.06	12.16	12.27	12.37	12.48
45	11.54	11.64	11.75	11.85	11.96
40	11.02	11.12	11.23	11.33	11.43
35	10.50	10.60	10.71	10.81	10.91
30	9.98	10.08	10.18	10.29	10.39
25	9.46	9.56	9.66	9.77	9.87
20	8.93	9.04	9.14	9.25	9.35
15	8.41	8.52	8.62	8.73	8.83
10	7.89	8.00	8.10	8.20	8.31
5	7.37	7.48	7.58	7.68	7.79
0	6.85	6.95	7.06	7.16	7.27

TABLE IX

Girls G.M.C.S.J .0846 C. I.

C. I.	0	1	2	3	4	5	6	7	8	9
590	49.91	50.00	50.08	50.17	50.25	50.34	50.42	50.51	50.59	50.68
580	49.07	49.15	49.24	49.32	49.41	49.49	49.58	49.66	49.74	49.83
570	48.22	48.31	48.39	48.48	48.56	48.65	48.73	48.81	48.90	48.98
560	47.38	47.46	47.55	47.63	47.71	47.80	47.88	47.97	48.05	48.14
550	46.53	46.61	46.70	46.78	46.87	46.95	47.04	47.12	47.21	47.29
540	45.68	45.77	45.85	45.94	46.02	46.11	46.19	46.28	46.36	46.45
530	44.84	44.92	45.00	45.09	45.18	45.26	45.35	45.43	45.51	45.60
520	43.99	44.08	44.16	44.25	44.33	44.42	44.50	44.58	44.67	44.75
510	43.15	43.23	43.32	43.40	43.48	43.57	43.65	43.74	43.82	43.91
500	42.30	42.38	42.45	42.55	42.64	42.72	42.81	42.89	42.98	43.06
490	41.45	41.54	41.62	41.71	41.79	41.88	41.96	42.05	42.13	42.22
480	40.61	40.69	40.78	40.86	40.95	41.03	41.12	41.20	41.28	41.37
470	39.76	39.85	39.93	40.02	40.10	40.19	40.27	40.35	40.44	40.52
460	38.92	39.00	39.09	39.17	39.25	39.34	39.42	39.51	39.59	39.68
450	38.07	38.15	38.24	38.32	38.41	38.49	38.58	38.66	38.75	38.83
440	37.22	37.31	37.39	37.48	37.56	37.65	37.73	37.82	37.90	37.99
430	36.38	36.46	36.55	36.63	36.72	36.80	36.89	36.97	37.05	37.14
420	35.53	35.62	35.70	35.79	35.87	35.96	36.04	36.12	36.21	36.29
410	34.69	34.77	34.86	34.94	35.02	35.11	35.19	35.28	35.36	35.45
400	33.84	33.92	34.01	34.09	34.18	34.26	34.35	34.43	34.52	34.60

TABLE X

Girls Norms for G.M.C.S.J .1064 C. I. + 6.83

C. I.	0	1	2	3	4	5	6	7	8	9
590	69.61	69.71	69.82	69.93	70.03	70.14	70.24	70.35	70.46	70.56
580	68.54	68.65	68.75	68.86	68.97	69.07	69.18	69.29	69.39	69.50
570	67.48	67.58	67.69	67.80	67.90	68.01	68.12	68.22	68.33	68.44
560	66.41	66.52	66.63	66.73	66.84	66.95	67.05	67.16	67.27	67.37
550	65.35	65.46	65.56	65.67	65.78	65.88	65.99	66.09	66.20	66.31
540	64.29	64.39	64.50	64.61	64.71	64.81	64.92	65.03	65.14	65.24
530	63.22	63.33	63.43	63.54	63.65	63.75	63.86	63.97	63.07	64.18
520	62.16	62.26	62.37	62.48	62.58	62.69	62.80	62.90	63.01	63.12
510	61.09	61.20	61.31	61.41	61.52	61.63	61.73	61.84	61.95	62.05
500	60.03	60.14	60.24	60.35	60.46	60.56	60.67	60.77	60.88	60.99
490	58.97	59.07	59.18	59.29	59.39	59.50	59.60	59.71	59.81	59.92
480	57.90	58.01	58.11	58.22	58.33	58.43	58.54	58.65	58.75	58.86
470	56.84	56.94	57.05	57.16	57.26	57.37	57.48	57.58	57.69	57.80
460	55.77	55.88	55.99	56.09	56.20	56.31	56.42	56.62	56.63	56.73
450	54.71	54.82	54.92	55.03	55.14	55.24	55.35	55.45	55.56	55.67
440	53.65	53.75	53.86	53.97	54.07	54.18	54.28	54.39	54.50	54.60
430	52.58	52.69	52.79	52.90	53.01	53.11	54.22	53.33	53.43	53.54
420	51.52	51.62	51.73	51.84	51.94	52.05	52.16	52.26	52.37	52.48
410	50.45	50.56	50.67	50.77	50.88	50.99	51.09	51.20	51.31	51.41
400	49.39	49.50	49.60	49.71	49.82	49.92	50.03	50.13	50.24	50.35

TABLE XI

Boys G.M.C.S.B 1.3577 Sargent jump

Sargent jump	0, 5	1, 6	2, 7	3, 8	4, 9
45	61.10	62.45	63.81	65.17	66.53
40	54.31	55.67	57.02	58.38	59.74
35	47.52	48.88	50.23	51.59	52.95
30	40.73	42.09	43.45	44.80	46.16
25	33.94	35.30	36.66	38.02	39.37
20	27.15	28.51	29.87	31.23	32.58
15	20.37	21.72	23.08	24.44	25.80
10	13.59	14.93	16.29	17.65	19.01
5	6.79	8.15	9.50	10.86	12.22

TABLE XII

Boys G.M.C.S.B 5.0006 Burpee

Burpee	0	¼	½	¾
9	45.01	46.26	47.51	4876.
8	40.00	41.25	42.51	43.96
7	35.00	36.25	37.50	38.75
6	30.00	31.25	32.50	33.75
5	25.00	26.25	27.50	28.75
4	20.00	21.25	22.50	23.75
3	15.00	16.25	17.50	18.75
2	10.00	11.25	12.50	13.75

TABLE XIII

Boys G.M.C.S.B .8731 Brace

Brace		Brace	
12	10.48	5	4.37
11	9.60	4	3.49
10	8.73	3	2.62
9	7.86	2	1.75
8	6.98	1	.87
7	6.11		
6	5.24		

TABLE XIV

Boys G.M.C.S.B 2730 C. I. — 43.95

C. I.	0	1	2	3	4	5	6	7	8	9
610	122.58	122.85	123.13	123.40	123.67	123.95	124.22	124.49	124.76	125.04
600	119.85	120.12	120.40	120.67	120.94	121.22	121.49	121.76	122.03	122.31
590	117.12	117.39	117.67	117.94	118.21	118.49	118.76	119.03	119.30	119.58
580	114.39	114.66	114.94	115.21	115.48	115.76	116.03	116.30	116.57	116.85
570	111.16	111.93	112.20	112.48	112.75	113.03	113.30	113.57	113.84	114.12
560	108.93	109.20	109.48	109.75	110.02	110.30	110.57	110.84	111.11	111.39
550	106.20	106.47	106.75	107.02	107.29	107.57	107.84	108.11	108.38	108.66
540	103.47	103.74	104.02	104.29	104.56	104.84	105.11	105.38	105.65	105.93
530	100.74	101.01	101.29	101.56	101.83	102.11	102.38	102.65	102.92	103.20
520	98.01	98.28	98.56	98.83	99.10	99.38	99.65	99.92	100.19	100.47
510	95.28	95.55	95.83	96.10	96.39	96.65	96.92	97.19	97.46	97.74
500	92.55	92.82	93.10	93.37	93.64	93.92	94.19	94.46	94.73	95.01
490	89.82	90.09	90.37	90.64	90.91	91.19	91.46	91.73	92.00	92.28
480	87.09	87.36	87.64	87.91	88.18	88.46	88.73	89.00	89.27	89.55
470	84.36	84.63	84.91	85.18	85.45	85.73	86.00	86.27	86.54	86.82
460	81.63	81.90	82.18	82.45	82.72	83.00	83.27	83.54	83.81	84.09
450	78.90	79.19	79.45	79.72	78.00	80.27	80.54	80.81	81.08	81.36
440	76.17	76.44	76.72	76.99	77.26	77.54	77.81	78.08	78.35	78.63
430	73.44	73.71	73.99	74.26	74.53	74.81	75.08	75.35	75.62	75.90
420	70.71	70.98	71.26	71.53	71.80	72.08	72.35	72.62	72.89	73.17
410	67.98	68.25	68.53	68.80	69.07	69.35	69.62	69.89	70.16	70.44
400	65.25	65.52	65.80	66.07	66.34	66.62	66.89	67.16	67.43	67.71

TABLE XV

Boys Norms for G.M.C.S.B .4055 C. I. — 49.24

C. I.	0	1	2	3	4	5	6	7	8	9
610	198.11	198.52	198.93	199.33	199.74	200.14	200.55	200.95	201.36	201.76
600	194.06	194.46	194.87	195.28	195.68	196.09	196.49	196.90	197.30	197.71
590	190.01	190.41	190.82	191.32	191.63	192.03	192.44	192.84	193.25	193.65
580	185.95	186.36	186.76	187.17	187.57	187.98	188.38	188.79	189.19	189.60
570	181.90	192.30	182.71	183.11	183.52	183.92	184.33	184.73	185.14	185.54
560	177.84	178.25	178.65	179.06	179.46	179.87	180.27	180.68	181.08	181.49
550	173.79	174.19	174.60	175.00	175.41	175.81	176.22	176.62	177.03	177.43
540	169.73	170.14	170.54	170.95	171.35	171.76	172.16	172.57	172.97	173.38
530	165.68	166.08	166.49	166.89	167.30	167.70	168.11	168.51	168.92	169.32
520	161.62	162.03	162.43	162.84	163.34	163.65	164.05	164.46	164.86	165.27
510	157.57	157.97	158.38	158.78	159.19	159.59	160.00	160.40	160.81	161.21
500	153.51	153.92	154.32	154.73	155.13	155.54	155.94	156.35	156.75	157.16
490	149.46	149.86	150.27	150.67	151.08	151.48	151.89	152.29	152.70	153.10
480	145.40	145.81	146.21	146.62	147.02	147.03	147.83	148.24	148.64	149.05
470	141.35	141.75	142.16	142.56	142.97	143.37	143.78	144.18	144.59	144.99
460	137.29	137.70	138.10	138.51	138.91	139.92	139.72	140.13	140.53	140.94
450	133.24	133.64	134.05	134.45	134.86	135.26	135.67	136.07	136.48	136.88
440	129.18	129.59	129.99	130.40	130.80	131.21	131.61	132.02	132.42	132.82
430	125.13	125.53	125.94	126.34	126.75	127.15	127.56	127.96	128.37	128.77
420	121.07	121.48	121.88	122.29	122.69	123.10	123.50	123.91	124.31	124.71
410	117.01	117.42	117.83	118.23	118.64	119.04	119.45	119.85	120.26	120.66
400	112.96	113.37	113.77	114.18	114.58	114.99	115.39	115.80	116.20	116.61

TABLE XVI

Boys G.M.C.S.J 1.3292 Sargent jump

Sargent jump	0, 5	1, 6	2, 7	3, 8	4, 9
45	59.81	61.14	62.47	63.80	65.13
40	53.17	54.50	55.83	57.16	58.48
35	46.52	47.82	49.18	50.51	51.84
30	39.88	41.21	42.53	43.86	45.19
25	32.23	34.56	35.89	37.22	38.55
20	26.58	27.91	29.24	30.57	31.90
15	19.94	21.27	22.60	23.93	25.25
10	13.29	14.62	15.95	17.30	18.61
5	6.65	7.98	9.30	10.63	11.96

TABLE XVII

Boys G.M.C.S.J 3.4095 Burpee

Burpee	0	¼	½	¾
9	30.69	31.54	32.39	33.24
8	27.28	28.13	28.98	29.83
7	23.87	24.72	25.57	26.42
6	20.46	21.31	22.16	23.01
5	17.05	17.90	18.75	19.60
4	13.64	14.49	15.34	16.20
3	10.23	11.08	11.93	12.79
2	6.82	7.67	8.52	9.38

TABLE XVIII

Boys G.M.C.S.J .4352 Johnson

Johnson	0, 5	1, 6	2, 7	3, 8	4, 9
50	21.77	22.20	22.64	23.07	23.51
45	19.45	20.02	20.46	20.89	21.33
40	17.41	17.85	18.28	18.72	19.15
35	15.24	15.67	16.11	16.54	16.98
30	13.06	13.49	13.93	14.36	14.80
25	10.88	11.32	11.75	12.19	12.62
20	8.71	9.14	9.58	10.01	10.45
15	6.53	6.96	7.40	7.84	8.27
10	4.35	4.79	5.22	5.66	6.09
5	2.18	2.61	3.05	3.48	3.92
0	.00	.44	.87	1.31	1.74

TABLE XIX

Boys G.M.C.S.J .2507 C. I. — 27.87

C. I.	0	1	2	3	4	5	6	7	8	9
610	125.06	125.31	125.56	125.81	126.06	126.31	126.56	126.81	127.06	127.31
600	122.55	122.80	123.05	123.30	123.55	123.80	124.05	124.30	124.56	124.81
590	120.04	120.29	120.54	120.80	121.05	121.30	121.55	121.80	122.05	122.30
580	117.54	117.79	118.04	118.29	118.54	118.79	119.04	119.29	119.54	119.79
570	115.03	115.30	115.53	115.78	116.03	116.28	116.53	117.78	117.03	117.29
560	112.52	112.77	113.02	113.27	113.52	113.78	114.03	114.28	114.53	114.78
550	110.02	110.27	110.52	110.77	111.01	111.27	111.52	111.77	112.02	112.27
540	107.51	107.76	108.01	108.26	108.51	108.76	109.01	109.26	109.51	109.76
530	105.00	105.25	105.50	105.75	106.00	106.25	106.51	106.76	107.01	107.26
520	102.49	102.74	103.00	103.25	103.50	103.75	104.00	104.25	104.50	104.75
510	99.99	100.24	100.49	100.74	100.99	101.24	101.49	101.74	101.99	102.24
500	97.48	97.73	98.98	98.23	98.48	98.73	98.98	99.23	99.49	99.74
490	94.97	95.22	95.47	95.73	95.98	96.23	96.48	96.73	96.98	97.23
480	92.47	12.72	92.97	93.22	93.47	93.72	93.97	94.22	94.47	97.72
470	89.96	90.21	90.46	90.71	90.96	91.21	91.46	91.71	91.96	92.22
460	87.45	87.79	87.95	88.20	88.45	88.71	88.96	89.21	89.46	89.71
450	84.95	85.20	85.45	85.70	85.95	86.20	86.45	86.70	86.95	87.20
440	82.44	82.69	82.94	83.19	83.44	83.69	83.94	84.19	84.44	84.69
430	79.93	80.18	80.43	80.68	80.93	81.18	81.44	81.69	81.94	82.19
420	77.42	77.67	77.93	78.18	78.43	78.68	78.93	79.18	79.43	79.68
410	74.92	75.17	75.42	75.67	76.92	76.17	76.42	76.67	76.92	77.17
400	72.41	72.66	72.91	73.16	73.41	73.66	73.91	74.16	74.42	74.67

TABLE XX

Boys Norms for G.M.C.S.J .4073 C. I. — 48.47

C. I.	0	1	2	3	4	5	6	7	8	9
610	197.99	198.19	198.59	199.00	199.40	199.81	200.21	200.61	201.02	201.42
600	193.75	194.15	194.56	194.96	195.36	195.77	197.17	196.58	196.98	197.38
590	189.71	190.12	190.52	190.92	191.33	191.73	192.14	192.54	192.94	193.35
580	185.68	186.08	186.48	186.89	187.29	187.69	188.10	188.50	188.91	189.21
570	181.64	182.04	182.45	182.85	183.25	183.66	184.06	184.46	184.87	185.27
560	177.60	178.01	178.41	178.81	179.22	179.62	180.02	180.43	180.83	181.24
550	173.57	173.97	174.37	174.78	175.18	175.58	175.99	176.39	176.79	177.20
540	169.53	169.93	170.34	170.74	171.14	171.55	171.95	172.35	172.76	173.16
530	165.49	165.89	166.30	166.70	167.11	167.51	167.91	168.32	168.72	169.12
520	161.45	161.86	162.26	162.67	163.07	163.47	163.88	164.28	164.68	165.09
510	157.42	157.82	158.22	158.63	159.03	159.44	159.84	160.24	160.65	161.05
500	153.38	153.78	154.19	154.59	154.99	155.40	155.80	156.21	156.61	157.01
490	149.34	149.75	150.15	150.55	150.96	151.36	151.77	152.17	152.57	152.98
480	145.31	145.71	146.11	146.52	146.92	157.32	147.73	148.13	148.54	148.94
470	141.27	141.67	142.08	142.48	142.22	143.29	143.69	144.09	144.50	144.90
460	137.23	137.64	138.04	138.44	138.85	139.25	139.65	140.06	140.46	140.87
450	133.20	133.60	134.00	134.41	134.81	135.21	135.62	136.02	136.42	136.83
440	129.16	129.56	129.97	130.37	130.77	131.18	131.58	131.98	132.39	132.79
430	125.12	125.52	125.93	126.33	126.74	127.14	127.54	127.95	128.35	128.75
420	121.08	121.49	121.89	122.30	122.70	123.10	123.51	123.91	124.31	124.72
410	117.05	117.45	117.95	118.26	118.66	119.07	119.47	119.87	120.27	120.68
400	113.01	113..41	113.82	114.22	114.62	115.03	115.43	115.84	116.24	116.64

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A Study of Accuracy of Direction in Motor Skills at Different Distances as Determined by the Relative Size of the Angle of Error

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INTRODUCTION

During the last twenty years professional workers in the field of physical education have contributed a tremendous amount of research that has been of great value in organizing and promoting purposeful programs of physical education. As a matter of fact, much of the improvement in our programs may be correctly attributed, either directly or indirectly, to the knowledge made available through the medium of this research. As a result of many of these investigations, new problems have arisen which have been provocative of further research. Only with knowledge of the functional relationships that exist within certain areas can we proceed with reasonable assurance in developing and maintaining progressive programs of physical education.

In 1899, Woodworth[25] wrote as follows: "It is the accuracy of a movement that makes it purposive." Since then many attempts have been made to analyze motor skills in order to acquire a more thorough understanding of the synthesis of various factors in specific types of neuromuscular performance. The results of some of these studies, as suggested above, have indicated the necessity of further research for a better understanding of skill technique.

McCloy[19] has suggested a relationship between the accuracy of direction, as determined by the size of the angle of error, and the distance from the target as one of the factors in motor educability. If there is a relationship between the distance from a target and the size of the angle of error, knowledge of that relationship should certainly be pertinent to the field of physical education.

A review of the literature seems to indicate that there are certain relationships existing between accuracy of direction and the distance from the target. This study is made in the hope that further knowledge may be added to this phase of motor skill analysis.

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* Superior figures refer to Bibliography at end of article.

STATEMENT OF THE PROBLEM

The purpose of this study* is to determine, by the use of the relative size of the angle of error as a basis of discrimination, whether or not there are significant differences in accuracy of direction in certain motor skills at different distances.

The problem, as pursued, resolves itself into the determination of the relative size of the angle of error at different distances in the following motor skills: throwing a baseball, throwing a football, throwing a basketball with a two-handed push shot, throwing a basketball with a one-handed push shot, shooting an arrow, striking a tennis ball with a racquet, using a forehand drive, "pitching" a golf ball with an iron club.

The relative size of the angle of error at different distances from the target was determined for deviations to the left and to the right of a vertical axis through the center of the target, for deviations above and below a horizontal axis passing through the center of the target, and for the total deviation from the center of the target.

REVIEW OF THE LITERATURE

The use of many types of targets is found recorded in studies that have been made for various purposes. Young and Moser[26] used a moving target as a test item in constructing a short battery of tests to predict playing ability in women's basketball. Hicks[12] also used a moving target to study the effects of practice in throwing at a moving target with subjects ranging from three to six years of age.

Stationary targets have often been used to determine accuracy in various motor skills. Targets used to measure accuracy in throwing are generally placed in such a manner that the face of the target is perpendicular to the plane on which the subject stands. Targets used by Clevett[3] and by Edgren and Robinson[8] to measure accuracy in "pitch" shots and in putting in golf were placed in a horizontal position on the same plane as that upon which the subject stood. Targets with concentric circles have been used most frequently, although the rectangular type of marking has been used by Johnson[16] and by others.

In an experiment with a light gun, Voigt[24] found, by having an assistant stand behind a target of ground glass to mark the point at which the beam of light struck the target, that the angle of error decreased, within limits, as the subject moved farther away from the target. When the gun was held at breast height he found that the angle of error at a distance of six meters from the target was one hundred seventy-nine minutes; at a distance of fifteen meters from the target the angle of error was one hundred thirty-one minutes, and at twenty-five meters the angle of error was only one hundred

* Abstract of doctoral dissertation, State University of Iowa, May, 1942.

twelve minutes. In his experiment the sights of the gun were not used in aiming the gun. He found that from thirty meters on out there was no substantial decrease in the size of the angle of error. He also found in shooting from hip height with one hand, that the angle of error two meters from the target was two hundred fifty-one minutes, and at a distance of eight meters from the target the angle of error was only one hundred twenty-five meters. Shooting with two hands from the same height, the angle of error was found to decrease from one hundred seventy-three minutes at two meters from the target, to eighty-seven minutes at eight meters from the target. He further found that with upward shooting the angle of error decreased from one hundred seventy-three minutes to one hundred fifty minutes when the distance from the target was increased from two meters to twelve meters. It was also found that the distance between the eye and the hand in which the gun was held could be increased to a magnitude of seventy centimeters without influencing the tendency of the angle of error to decrease when the distance from the target was increased.

McCloy[21] found that in shooting baskets in basketball, the percentage of errors at a distance of twenty feet from the basket was greater than the percentage of errors made from a distance of thirty-five feet from the basket. Oliphant[23] found that the twenty-foot distance from the basket yielded a greater percentage of successful shots in basketball games than either the ten-foot or the fifteen-foot distance. He also found approximately the same percentage of successful shots from the thirty-foot distance as he found under similar circumstances from the ten-foot distance.

Griffith[11] found in a study of free throws, fifteen feet from the basket, that approximately twice as many errors were made with reference to the distance as were made in the direction of the throw. This finding is supported by Oliphant[23] as being true for shots from other areas of the playing court.

In experimenting with children from three to six years of age, who threw at a moving target, Hicks[12] found that there were approximately twice as many throws below the center of the target as there were above the center of the target.

In reporting an experiment in which he used two classes of men to study the acquisition of skill in archery, Lashley[17] suggests that a large number of shots are necessary for satisfactory reliability. He states: "The average of any small number of shots does not give a fair measure of the skill of the individual, and the use of such averages as a measure of the initial and final accuracy and amount of improvement does not lead to trustworthy results."

SELECTION OF SUBJECTS

After preliminary experimentation it was decided to make use of a relatively small number of subjects in whom the specific motor skills were developed to a high degree of proficiency. This procedure should tend to reduce the variability of the angle of error and should also tend to reduce the variability due to the practice element. In each of the activities either five or six men were used, and all of the subjects were right handed.

A minimum of one hundred trials for each subject at each distance was exacted.

DESCRIPTION OF TESTS

The targets used in measuring the angles of error in throwing a baseball, in throwing a football, in shooting an arrow, and in striking a tennis ball with a racquet using a forehand drive, were rectangular, approximately nine feet by ten feet. Lines, one-half inch in width, were painted horizontally and vertically on the target. These lines were six inches apart, that is, the distance from the center of one line to the centers of the lines parallel to it was six inches. The entire target was, by this lining, cross-sectioned with six-inch squares. The center square of each target was painted the color of the lines except for a circle two inches in diameter in its center, which was left the same color as that of the background of the target. The targets for each of the above-mentioned motor skills were erected with their faces perpendicular to the plane of the floor or ground.

The centers of each of the targets mentioned above were raised to heights equal to the mean heights of the points of release (or impact in the case of tennis) for each group of subjects.

The target for "pitching" a golf ball with an iron club was a level portion of a playing field. It was a rectangle, seventeen yards by twenty-five yards, cross-sectioned with cord string at intervals of one yard. In the center of the center square, a metal container eight and one-half inches in diameter was counter-sunk in the ground with its open end six inches above the level of the target. This container was clearly visible at a distance of sixty yards.

The target for both types of basketball shots was a five-eighths'-inch piece of plywood, five feet by six feet. It was cross-sectioned into six-inch squares, as were the targets mentioned above, and in the center of the target a circular hole twelve inches in diameter was cut. The target was placed at a forty-five degree angle with the floor, and the center of the target was raised to a height of one hundred thirty and one-half inches, which was five feet plus the average height of the point of release of the ball for the subjects used in these two skills.

In all cases the subjects were instructed to attempt to hit that

part of the target designated as the center by the markings as described above.

Restraining lines for each of the skills were established at distances from the center of each of the targets as follows: for throwing a baseball, 15 feet, 30 feet, 45 feet, 60 feet, and 75 feet; for throwing a football, 15 feet, 30 feet, 45 feet, 60 feet, and 75 feet; for throwing a basketball with a one-handed push shot, 10 feet, 15 feet, 20 feet, 25 feet, 30 feet, and 35 feet; for throwing a basketball with a two-handed push shot, 10 feet, 15 feet, 20 feet, 25 feet, 30 feet, and 35 feet; for shooting an arrow, 10 yards, 20 yards, 30 yards, 40 yards, and 50 yards; for striking a tennis ball with a racquet, using a forehand drive, 15 feet, 25 feet, 35 feet, 45 feet, and 55 feet; for "pitching" a golf ball with an iron club, 20 yards, 30 yards, 40 yards, 50 yards, and 60 yards.

For golf, these lines intersected a line drawn from the center of the target and perpendicular to the horizontal axis of the target. Restraining lines for the other skills intersected a line drawn from the center of the target, projected upon the plane on which the subject stood while taking his trials, and which was perpendicular to a plane formed by the projected point and the horizontal axis passing through the center of the target. Care was taken in each case that the point of release (or impact in the case of tennis and golf) was over this established restraining line.

ADMINISTRATION OF THE TESTS

In all cases subjects were permitted a "warming up" period. After this preliminary practice they were permitted two or three practice trials, but not at the distance at which they were to start that day. After the trials were started, no practice was permitted between trials.

In all instances, except in the cases of tennis, twenty trials were taken each day at each distance. In the administration of the trials each subject started on the first day at the distance nearest the target with ten trials. He then moved back to the next distance for ten trials, and so on until he reached the distance farthest away from the target. At the distance farthest from the target he took twenty trials and then proceeded to move in toward the target, taking ten trials from each distance until he had completed his ten trials at the distance at which he started. On the second day he proceeded in a similar fashion, except that he started with ten trials at the second nearest distance, then moved back as before, taking ten trials at each distance, until he reached the distance farthest away from the target where he took only ten trials. He then went to the distance nearest the target, where he took twenty trials. From here he went to the distance farthest away from the target, taking ten trials there, and

then moved in toward the target, taking ten trials at each distance, until he had completed his last ten trials at the distance where he started. This procedure was followed throughout the experiment, the subject being required to start at a distance one restraining line farther back than he did on the last previous trial.

In the various motor skills each subject completed one hundred trials at each distance, except those subjects in tennis, each of whom completed one hundred-twenty trials at each distance.

With each attempt by a subject to hit the center of the target, the point on the target which was actually hit was observed and recorded on a chart corresponding to the outline of the target. Hits made upon division lines of the target were recorded as having been made in those squares lying nearest the center of the target.

COMPUTATION OF THE ANGLES OF ERROR

For the purpose of this study the angle of error is defined as the number of minutes between two lines, one of which is determined by the point of release of the ball (or arrow) and the point on the target which the subject attempted to hit. The other line is determined by the point of release of the ball (or arrow) and the point on the target which is actually hit.

Angles of error were computed upon the assumption that any hit within a square was made upon the center of that square, and the distance of the hit from the center of the target was determined by the distance from the center of the bull's eye to the center of the square in which the hit was made. Angles of error to the left and to the right of the vertical axis of the target, and above and below the horizontal axis of the target, were determined by the distance between the center of the square that was hit and the centers of the squares lying on the vertical and horizontal axes nearest the hit, that is, the perpendicular distance to the vertical and the horizontal axes, respectively.

In the baseball, the football, the archery, and the tennis trials, the line determined by the point of release and the point on the target which the subject is attempting to hit, is perpendicular to the plane of the target, and consequently the angle of error was ascertained by the computation of the tangent of the angle.

In golf, the angle of error was also ascertained by the computation of the tangent of the angle, inasmuch as the shot was made from the same plane as the location of the face of the target. Deviations to the left or right could be determined in minutes, but deviations due to the shortness or the excess in length of shots were recorded in the study in yards.

In basketball, the angle of error was determined by applying the formula for the determination of an angle upon the basis of three known sides of a triangle.

ANALYSIS OF THE DATA

Because the number of subjects for each of the motor skills was small and because the subjects were not selected at random, an analysis of variance was made according to the principle of "interaction" variance and the *T* test for significance outlined by Lindquist.[18] The use of this analysis permits the application of the standard error of a difference between angle of error means, at different distances for any one of the groups of subjects, as a test of significance.

At each distance the means were determined, in minutes, for deviations to the left and to the right of the vertical axis of the target, for deviations above and below the horizontal axis of the target, and for the total angle of error.

For each group of means, that is, the total angle of error, the angle of error to the left of the vertical axis, the angle of error to the right of the vertical axis, the angle of error above the horizontal axis, and the angle of error below the horizontal axis, differences in the means at different distances were determined. The standard error of a difference between means was computed in each case, and also the maximum error, at both the 5 per cent and the 1 per cent levels of confidence, in the differences between all combinations of pairs of means in each motor skill, for the application of the *T* test for significance.

The following tabulations list the significant differences between the means of the angle of error in the different motor skills at different distances:

TABLE I

BASEBALL

Type of Deviation from Center	Increase in Distance (feet)	Change in Angle of Error	Level of Statistical Significance
Total	15 to 60	Increase	5%
Total	15 to 75	Increase	5
Left	15 to 30	Increase	1
Left	15 to 45	Increase	5
Left	15 to 60	Increase	5
Left	15 to 75	Increase	5

TABLE II

FOOTBALL

Type of Deviation from Center	Increase in Distance (feet)	Change in Angle of Error	Level of Statistical Significance
Total	15 to 30	Increase	1%
Total	15 to 45	Increase	1
Total	15 to 60	Increase	1
Total	15 to 75	Increase	1
Left	15 to 30	Increase	5
Left	15 to 45	Increase	1
Left	15 to 60	Increase	5
Left	15 to 75	Increase	1
Right	15 to 30	Increase	1
Right	15 to 45	Increase	1
Right	15 to 60	Increase	1
Right	15 to 75	Increase	1
Above	15 to 30	Increase	1
Above	15 to 45	Increase	1
Above	15 to 60	Increase	1
Above	15 to 75	Increase	1
Above	45 to 75	Decrease	5
Below	15 to 30	Increase	5
Below	15 to 45	Increase	1
Below	15 to 60	Increase	1
Below	15 to 75	Increase	1

TABLE III

BASKETBALL—TWO-HANDED SHOTS

Type of Deviation from Center	Increase in Distance (feet)	Change in Angle of Error	Level of Statistical Significance
Left	10 to 15	Decrease	1%
Left	10 to 20	Decrease	1
Left	10 to 25	Decrease	1
Left	10 to 30	Decrease	1
Left	10 to 35	Decrease	5
Below	10 to 20	Increase	1
Below	10 to 25	Increase	1
Below	10 to 30	Increase	1
Below	10 to 35	Increase	1
Below	15 to 25	Increase	5
Below	15 to 30	Increase	1
Below	15 to 35	Increase	1

TABLE IV

BASKETBALL—ONE-HANDED SHOTS

Type-of Deviation from Center	Increase in Distance (feet)	Change-in Angle of Error	Level of Statistical Significance
Total	10 to 15	Decrease	5%
Total	10 to 35	Increase	1
Total	15 to 25	Increase	5
Total	15 to 30	Increase	5
Total	15 to 35	Increase	1
Total	20 to 35	Increase	1
Total	25 to 35	Increase	1
Total	30 to 35	Increase	1
Left	10 to 35	Increase	1
Left	15 to 30	Increase	1
Left	15 to 35	Increase	1
Left	20 to 35	Increase	1
Left	25 to 35	Increase	1
Left	30 to 35	Increase	5
Right	10 to 30	Decrease	5
Above	10 to 30	Increase	5
Above	10 to 35	Increase	1
Above	20 to 35	Increase	1
Above	25 to 35	Increase	5
Below	10 to 20	Increase	5
Below	10 to 25	Increase	1
Below	10 to 30	Increase	1
Below	10 to 35	Increase	1
Below	15 to 25	Increase	1
Below	15 to 30	Increase	1
Below	15 to 35	Increase	1
Below	20 to 30	Increase	1
Below	20 to 35	Increase	1
Below	25 to 35	Increase	1

TABLE V

TENNIS

Type of Deviation from Center	Increase of Distance (feet)	Change in Angle of Error	Level of Statistical Significance
Above	15 to 55	Decrease	5%
Above	25 to 55	Decrease	5

TABLE VI

ARCHERY

Type of Deviation from Center	Increase in Distance (yards)	Change in Angle of Error	Level of Statistical Significance
Right	10 to 20	Increase	1%
Right	10 to 30	Increase	1
Right	10 to 40	Increase	1
Right	10 to 50	Increase	1
Above	10 to 20	Increase	5
Above	20 to 30	Decrease	1
Above	20 to 40	Decrease	1
Above	20 to 50	Decrease	1
Below	10 to 20	Increase	1
Below	10 to 30	Increase	1
Below	10 to 40	Increase	1
Below	10 to 50	Increase	1
Below	20 to 40	Increase	1
Below	20 to 50	Increase	1
Below	30 to 40	Increase	5
Below	30 to 50	Increase	1

TABLE VII

GOLF

Type of Deviation from Center	Increase in Distance (yards)	Change in Angle of Error	Level of Statistical Significance
Total	20 to 40	Increase	1%
Total	20 to 50	Increase	1
Total	20 to 60	Increase	1
Left	20 to 60	Increase	5
Right	20 to 40	Increase	1
Right	20 to 50	Increase	5
Right	30 to 40	Increase	5

TABLE VIII

GOLF

Type of Deviation from Center	Increase in Distance (yards)	Change in Yardage Error	Level of Statistical Significance
Beyond	20 to 30	Increase	1%
Beyond	20 to 40	Increase	1
Beyond	20 to 50	Increase	1
Beyond	20 to 60	Increase	1
Beyond	30 to 40	Increase	5
Beyond	30 to 50	Increase	1
Beyond	30 to 60	Increase	1
Beyond	40 to 50	Increase	5
Beyond	50 to 60	Increase	5
Short	20 to 30	Increase	1
Short	20 to 40	Increase	1
Short	20 to 50	Increase	1
Short	20 to 60	Increase	1
Short	30 to 50	Increase	1
Short	30 to 60	Increase	1
Short	40 to 50	Increase	5
Short	40 to 60	Increase	1
Short	50 to 60	Increase	1

From the results of this study the following conclusions may be made:

IN THROWING A BASEBALL

1. Accuracy of direction, as far as the total deviation from the center of the target is concerned, decreases only when the distance from the center of the target is increased from fifteen feet to sixty feet or seventy-five feet. There are no significant increases in accuracy with increases in distance in the total deviation from the center of the target.

2. Accuracy of direction to the left of the center of the target decreases when the distance from the center of the target is increased from fifteen feet to thirty feet, but from that point increased distances do not add to inaccuracy in the same direction.

3. There are no significant increases or decreases in accuracy to the right, above, or below the center of the target, when the distance from the center of the target is increased from fifteen feet to seventy-five feet with discrete increments of fifteen feet.

IN THROWING A FOOTBALL

1. Accuracy of direction, as determined by the total angle of error, decreases when the distance is increased from fifteen feet from the center of the target to thirty feet from the center of the target; but additional increases in distance of increments of fifteen feet each,

up to seventy-five feet from the center of the target show no further decrease or increase in accuracy.

2. The same treatment holds for accuracy to the left, to the right, above, and below the center of the target with one exception. When the distance is increased from forty-five feet from the center of the target to seventy-five feet, there is an increase in accuracy as far as the deviation above the center of the target is concerned.

IN THROWING A BASKETBALL WITH A TWO-HANDED PUSH SHOT

1. There is no increase or decrease in accuracy, as determined by the total angle of error, when the distance from the center of the target is increased from ten feet to thirty-five feet with increments of five feet. The same statement holds for accuracy above and to the right of the center of the target.

2. There is an increase in accuracy to the left of the center of the target when the distance from the center of the target is increased from ten feet to fifteen feet, but additional increases in accuracy are not present when the distance is increased to thirty-five feet.

3. There is a decrease in accuracy below the level of the center of the target when the distance from the center of the target is increased from ten feet to twenty feet and from fifteen feet to twenty-five feet, but there is no additional decrease in accuracy for further increases in distance up to and including thirty-five feet from the center of the target.

IN THROWING A BASKETBALL WITH A ONE-HANDED PUSH SHOT

1. There is an increase in accuracy, as determined by the total angle of error, when the distance from the center of the target is increased from ten to fifteen feet. However, when the distance from the target is increased, that is, from fifteen feet to twenty-five or thirty feet, a decrease in accuracy results; and when the distance is increased to thirty-five feet a marked decrease in accuracy is present.

2. Inaccuracy to the left of the center of the target increases markedly only when the distance is increased to thirty-five feet.

3. There is no marked increase or decrease in accuracy to the right of the center of the target when the distance is increased.

4. Only when the distance is increased to thirty-five feet are there marked increases in inaccuracy above the center of the target.

5. When the distance is increased from ten feet to twenty feet from the center of the target, there is a marked tendency to increased inaccuracy below the center of the target. This inaccuracy becomes increasingly greater as the thirty-five foot distance is approached.

IN SHOOTING AN ARROW

1. There are no significant increases or decreases in accuracy, as determined by the total angle of error, when the distance is increased from the center of the target, from ten yards to fifty yards with increments of ten yards. The same statement holds for accuracy to the left of the center of the target.

2. When the distance from the center of the target is increased from ten yards to twenty yards there is a decrease in accuracy to the right of the center of the target, but an additional increase of forty yards from the target, with increments of ten yards, resulted in no further inaccuracy in this direction.

3. Accuracy decreases above the center of the target with an increase in the distance from the face of the target from ten yards to twenty yards. However with an increase from twenty yards to thirty yards in the distance from the target, accuracy in this direction increases, although additional yardage increases result in no further increase in accuracy.

4. Accuracy decreases below the center of the target with an increase in distance from the face of the target from ten yards to twenty yards, and additional increases in the distance result in increased inaccuracy in this direction up to and including the forty-yard distance.

IN DRIVING A TENNIS BALL WITH A RACQUET

1. As far as the total deviation from the center of the target is concerned, there are no significant increases or decreases in accuracy, when the distance from the face of the target is increased from fifteen feet to fifty-five feet with increments of ten feet. The same statement holds for accuracy to the right, to the left, and below the center of the target.

2. There is an increase in accuracy above the center of the target when the distance from the face of the target is increased from fifteen feet to twenty-five feet to a distance of fifty-five feet.

IN "PITCHING" A GOLF BALL WITH AN IRON CLUB

1. There is a decrease in accuracy, as determined by the total deviation from the center of the target, when the distance from the center of the target is increased from twenty yards to forty yards, but no additional decrease in accuracy from forty yards on out to a distance of sixty yards.

2. Accuracy to the left of the center of the target decreases only when the distance is increased from the center of the target from twenty yards to sixty yards.

3. Accuracy to the right of the center of the target decreases when the distance is increased from twenty yards from the center

of the target to either forty yards or fifty yards from the same point. However there is no increase or decrease in accuracy in this direc-direction when the distance is increased from twenty yards from the center of the target to a distance of sixty yards from the center of the target.

4. There is a significant increase of the yardage in error both beyond and short of the center of the target, as the player moves away from the target. Significant increases in the yardage in error are observed for each additional twenty-yard increment in the distance from the target, with the exception that there is no decrease or increase of the yardage in error beyond the center of the target when the distance is increased from fifty yards to sixty yards. There is a greater tendency to "pitch" the ball short of the center of the target than to "pitch" it beyond that point.

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The Relationship of Timing and Vision To Baseball Performance

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THE PROBLEM

Up to the present, the only available techniques for measuring the potentialities of a baseball player have resided in the subjective judgments formed by an observer. This judgment, based on personal experience, while empirical, has brought fairly satisfactory results. It is obvious that a scientific approach might bring greater benefits and perhaps lead to an enhanced efficiency in the selection of candidates and the training of individuals. Vision and timing are not the only factors in batting but as a result of conversations with experts in the game, and a review of the literature on the subject of qualifications of good batters, this writer believes they rank high in importance, and warrant specific investigation. The degree to which these qualities are inherent and not essentially developmental has been questioned. On the other hand, there are opinions in the literature which maintain that there is no such thing as an instinct to run bases and that, if there is such a thing as "an eye for the ball," it must be a kind of skill which some men have acquired by practice and others have not.

Despite the opinions mentioned above, the investigator could find little data of an objective nature which might be used to substantiate the opinions indicated. The present study was undertaken in order to provide experimental data which might clarify the issue. Significant differences might be found among varsity athletes, rejected candidates, and non-athletes in the vision and timing measurements, and also bring to light the relative degrees of relationship of these factors to the batting criteria and performance levels used herein.

Other qualifications of a batter might well include competitive spirit, muscular strength and coordination, ability to pick good balls and to follow the pitch, relaxation and poise, proper mental attitude, determination and ability to withstand the "grind" of competition, ability to take criticism, susceptibility to grasp expert instruction, and proper timing and pace habits.

The problem of this study is to determine the relationship of timing and vision to successful batting in baseball, and also the probability that groups who do not play baseball are different from

groups who do, in terms of the abilities measured by the vision and timing tests employed.

Scientific techniques and methods of selection have received very little consideration from educators and performers alike. It is the hope of this investigation to bring to light possibilities for selection and development of baseball candidates. Analysis of the relationship of vision and timing to baseball performance, as determined by tests and standards used in this study, involved the following subsidiary problems: To what extent are the three batting criteria (batting average, slugging average, and runs batted in) intercorrelated? To what extent is vision related to batting? To what extent is timing related to batting? Does a difference exist in the relationship of timing and vision to success in batting? To what extent do college varsity baseball players, rejected candidates, and non-athletes differ from each other in vision and timing?

METHOD AND PROCEDURE

The initial step in the development of this investigation involved the selection of reliable and valid tests of vision and timing. The Keystone Opthalmic Telebinocular and DB Series of slides[1] were used in this study because of practicality in administration and use by opthalmologists as a preliminary screening test.

All of the tests were administered by this investigator and were conducted at the City College of New York.

The results of the vision examination were determined in the following areas and recorded on standard forms provided by the Keystone View Company.

1. Simultaneous Vision
2. Vertical Imbalance
3. Lateral Imbalance (Far Point)
4. Far Point Fusion
5. Binocular Visual efficiency
6. Left Eye Visual Efficiency
7. Right Eye Visual Efficiency
8. Clearness of Image
9. Lateral Imbalance (Near Point)
10. Near Point Fusion
11. Stereopsis

The vision measurements were secured with the aid of the necessary slides and the standard directions, for the administration of the test were followed with thoroughness. In the measurements for stereopsis, due consideration was extended to subjects because of their inability to immediately recognize those objects which stood out from the rest. The subjects were allowed one minute for acclimation and understanding. In order to pass the slide successfully, the subject had to identify the character in each row which stood out in front of the rest. Further test for stereopsis involved

[1] E. A. Betts, *The Prevention and Correction of Reading Difficulties*, (New York: Row Peterson and Co., 1936), 161-169, 323-350.

the use of additional slides. Three separate rows of characters were used and the total score recorded was the per cent of eye coordination for the last row read promptly and correctly.

The Keller Timing Instrument,[2] designed to measure the "Quickness of Bodily Movement," was selected because of demonstrated value in testing undergraduate athletes at the University of Minnesota and because of its applicability to this particular problem under investigation. The procedure for administering the timing test was outlined by Keller and also followed with care.

> A total of 36 measurements was taken of each subject. Eighteen of these involved movements made by the subject when he did not know in which direction he was to start until the illuminated arrow so indicated, and the other half were measurements made when the subject was told in which direction he was to move but was required to wait for the signal. The first group represented the type of reaction that is required in defensive situations in athletics whereas the latter movements are more nearly like the actions of a person on offense. In order that no pattern would be set by the operator in the defense type, 18 cards, 6 indicating left, 6, right, and 6, forward were shuffled before the test was started and were drawn one at a time to indicate to the tester which switch to throw.[3]

To investigate the problems there were secured four groups of subjects who were differentiated with respect to athletic achievement; namely, a group of high school players from four different schools, a group of college players from four different colleges, a group of rejected candidates for varsity baseball from the City College of New York, and a group of non-athletes from the City College of New York.

The high school and college varsity athletes were contacted through the cooperation of coaches and team managers. The non-athletes were contacted through the cooperation of members of the Department of Hygiene at the City College. The investigator personally administered the vision and timing tests according to the standard and uniform instructions, and collected a total of 161 measurements. Of this number, 45 were from the high school players, 47 from the college varsity players, 20 from rejected candidates, and 49 from non-athletes. From the records of games played, batting averages, number of runs batted in, and slugging averages were computed and recorded on special forms constructed for the purpose. The three items mentioned above were used as criteria for determining achievement in batting.

In determining achievement in batting, this study considered the criteria of batting average, runs batted in, and slugging average, which were utilized to present the total picture of a player's achievement. Standard scores of batting average, slugging average, and

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2 L. F. Keller, "The Relation of 'Quickness of Bodily Movement' to Success In Athletics," RESEARCH QUARTERLY, 13 (1942), 146-155.

3 *Ibid.*, p. 148.

runs batted in were computed for each high school and each college. These standard scores were used for purposes of comparison and also to indicate relationships. Coefficients of intercorrelation were obtained among the batting criteria using the Pearson Product Moment Method.

An experimental problem which attempts to find reasons for distinction in a group which have a high degree of the ability which we are trying to predict, may be contrasted with an experimental problem which attempts to distinguish individuals who may succeed from those who are less likely to. One idea is to discover the important aspects of success when people are already expert, and the other, to screen out those individuals at the very bottom in ability.

The former of these problems was treated first, and the high school and college varsity batting measurements were correlated with the timing and vision scores.

The latter portion of this thesis treats the second of these problems; that is, it calculates the probability that groups who do not play baseball are different from groups who do, in terms of the abilities measured by the timing and vision tests as used in this study.

The statistical techniques by which the relationships, comparisons, and analyses were carried out included standard scores, Pearson Product Moment correlation, and chi-square tests.

RELIABILITY OF THE TEST

In order to establish reliability of the timing tests, the Split-Half method was employed. The test was broken into two parts; the first half correlated with the second half by the Pearson Product Moment Method[4] for both high school and college materials in the Directed Timing Test. The same procedure was followed with the records in the Choice Timing Test.

The obtained split-half correlation indicated in Table I was corrected by the Spearman Brown Method.[5] $r_{11} = \frac{2r_{\frac{1}{2}\cdot\frac{1}{2}}}{1+r_{\frac{1}{2}\cdot\frac{1}{2}}}$ These correlations are also indicated in Table I.

TABLE I

RELIABILITY OF THE TESTS

Timing Tests	Split Half $r_{\frac{1}{2}\cdot\frac{1}{2}}$	Spearman Brown r_{11}
Directed (H.S.)	.7985	.88
Directed (Coll.)	.8703	.93
Choice (H.S.)	.7337	.85
Choice (Coll.)	.8861	.94

4 H. E. Garrett, *Statistics in Psychology and Education*, p. 311.

5 C. C. Peters, and W. R. Van Voorhis, *Statistical Procedures and Their Mathematical Bases*, p. 194.

Keller[6] also found that the instruments and techniques used in his study were reliable.

THE FINDINGS

Achievement in batting was determined by a consideration of standard scores of batting average, runs batted in, and slugging average. These standard scores were used for purposes of comparison and also to indicate relationships.

The results reveal that conditions of competition afforded equal opportunity for distinction in all groups and individual differences within any one group were the same as any other. By use of the Pearson Product Moment method, intercorrelations were computed for the three batting criteria in order to substantiate the mutual importance and interdependence of these items for determining achievement in batting.

These intercorrelations are, of course, limited to the variance which occurs within any one team. The difference in ability between teams has, of necessity, been discarded since the conditions of measurement differed. Player performances are affected by the competitive conditions which are the basis of measurement and the teams generally do not perform against the same opponents with fixed levels of performance.

The intercorrelations of batting average, runs batted in, and slugging average, are presented in Table II.

TABLE II

THE INTERCORRELATION OF BATTING CRITERIA USING STANDARD SCORES WITHIN EACH HIGH SCHOOL AND EACH COLLEGE

Batting Criteria	High Schols N = 45 r	Colleges N = 47 r
Slugging Average and Batting Average	.89	.82
Runs Batted In and Batting Average	.75	.53
Runs Batted In and Slugging Average	.79	.75

The intercorrelations of the batting criteria of batting average (BA), runs batted in (RBI), and slugging average (SA) are all postive and rather high[7] except for an r of .53 between runs batted in and batting average in the college varsity group, serving to sup-

[6] Keller, *op. cit.*, p. 148.

[7] Garrett, *Statistics in Psychology and Education*, p. 342, states that there is a fairly good agreement among workers with psychological and educational tests, that an r from ± .40 to ± .70 denotes substantial or marked relationship; r from ± . 70 to ± 1.00 denotes high to very high relation.

"High" as used in this description means showing enough relationship within the chance error to be expected, to indicate that records of success in one test are likely to be associated with records of success in others to sufficient degree to indicate some common factor of ability.

port the investigator's original contention as to the mutual importance and interdependence of these items in the consideration of the total picture of a player's achievement in batting. They give satisfactory evidence that individual differences in these tests are functions of the individual and indicate the reliability of the tests. The slightly lower correlation between BA and RBI, as against BA and SA, may be explained by the fact that the number of runs batted in is too frequently dependent on the element of chance concerning opportunities to bat in runs when a man comes to bat. For instance, when an individual comes to bat with teammates on base and obtains a three-base hit, an increase in his BA and RBI will result. On the other hand if the same individual makes a three-base hit with no one on base, his batting average increases the same increment, but his runs batted in average remain unchanged.

TIMING MEASUREMENTS FOR THE NON-ATHLETE, REJECTED CANDIDATE, HIGH SCHOOL, AND COLLEGE VARSITY GROUPS

Means and standard deviations were computed for the four groups on the choice and directed timing tests. The parameters are presented in Table III.

TABLE III

MEASURES* OF CENTRAL TENDENCY AND VARIABILITY OF ALL GROUPS IN THE CHOICE AND DIRECTED TIMING TESTS

Timing Test	Colleges N = 47 Mn-S.D.	High Schools N = 45 Mn-S.D.	Non-Athletes N = 49 Mn-S.D.	Rejected N = 20 Mn-S.D.
Choice Trials	270-11.5	279-10.2	287-11.1	276-10.0
Directed Trials	233-19.2	237-14.9	246-13.5	234-10.8

* All timing scores are recorded in 1/300 of a second.

VISION MEASUREMENTS FOR NON-ATHLETES, REJECTED CANDIDATES, HIGH SCHOOL, AND COLLEGE VARSITY GROUPS

Some of the Keystone Tests allow expression as a variable. Whenever this is the case evaluations were made of the variable by comparing its distribution in two groups. However, these same measurements were also expressed as categories and included in the table in which the categories were evaluated. The reason for this double treatment is that differences which occur between two groups in a variable may or may not be present when this variable is expressed as a category. The means and standard deviations were computed

for each of the four groups in the vision variable tests. A separate evaluation was made of the left- and right-eye measures. If we should use the measurements of the left eye as our basis for comparison then we would be comparing individuals who are satisfactory in their left eye with other individuals who are unsatisfactory in their left eye, and so would include in the satisfactory group some individuals who were, nevertheless, very unsatisfactory in their right eye. This would be anomalous since we are not interested in an activity where the left eye alone is used. For this reason separate eye measurements were stated as lowest value in either eye. The variable now measures how well each individual can see out of his worst eye. Thus cases having a left-eye defect are grouped with cases having a right-eye defect and contrasted with cases having no defect in either eye. The figures are indicated in Table IV.

TABLE IV

MEASURES OF CENTRAL TENDENCY AND VARIABILITY OF ALL GROUPS IN THE VISION VARIABLES

Vision Variables	Colleges N = 47 Mn-S.D.	High Schools N = 45 Mn-S.D.	Non-Athletes N = 49 Mn-S.D.	Rejected Cand N = 20 Mn-S.D.
Binocular Visual Efficiency	102- 6.3	102-12.2	96-16.4	99- 9.5
Lowest Eye Efficiency (L. or R.)	95- 9.7	91-14.1	80-20.7	90-10.0
Stereopsis	38-23.9	30-21.4	21-20.3	28-13.2 N = 19

CATEGORICAL VISION MEASUREMENTS OF ALL THE GROUPS ON EACH OF THE CATEGORICAL VISION TESTS

Vision measurements expressed as variables are also included in the table in which categories were evaluated. The reason for this double treatment is to substantiate previously obtained results or uncover new ones.

The number and percentages of failures on each of the vision tests for all groups are recorded in Table V.

TABLE V

COMPARISON OF THE TOTAL PER CENT OF FAILURES AMONG THE GROUPS ON EACH OF THE ELEVEN CATEGORICAL VISION TESTS

Vision Tests	N = 47 College Varsity		N = 47 High Schools		*N = 49 Non-Athletes		*N = 20 Rejected Candidates	
Test	No. of Failures	Per Cent	No. of Failures	Per Cent	No.of Failures	Per Cent	No. of Failures	Per Cent
1 Simultaneous Vision	—	—	1	2.2	4	8.2	3	15.0
2 Vertical Imbalance	—	—	1	2.2	1	2.0	—	—
3 Lateral Imbalance	1	2.1	3	6.7	4	8.2	6	30.0
4 Far Point Fusion	6	12.8	5	11.1	11 N=47	23.4	5 N=18	27.8
5 Binocular Visual Efficiency	4	8.5	2	4.4	6	12.2	2	10.0
6 Left Eye Visual Efficiency	4	8.5	8	17.8	14 N=48	29.2	4	20.0
7 Right Eye Visual Efficiency	6	12.8	7	15.6	9	18.4	3	15.0
8 Clearness of Image	6	12.8	8	17.8	11 N=46	23.9	2 N=19	10.5
9 Lateral Imbalance (near point)	8	17.0	12	26.7	20	40.8	7	35.0
10 Near Point Fusion	3	6.4	9	20.0	15 N=46	32.6		
11 Stereopsis	3	6.4	3	6.7	11	22.4	1 N=19	5.3

* Differences in the number on different tests is due to exclusion of some cases because of insufficient scoring.

The distribution of test failures for the college varsity group seems to indicate a fairly uniform spread on each of the categorical vision tests.

The Pearson Product Moment method was used to correlate the vision and timing variables with the three batting criteria. The correlations of high school records with the choice and directed timing tests were all so low as to make the distinctions of little value. This may be interpreted to mean that no significant relationship was disclosed between the timing tests and the batting criteria amongst skilled baseball players. This might well be expected since other factors besides those used in this investigation

obviously enter into the batting ability which forms the criterion. The correlation of the vision variables of binocular visual efficiency, lowest eye efficiency, and stereopsis with the batting criteria disclosed no significant positive relationships.

In order to indicate the relation which existed between the vision categories and the batting criteria, standard score distributions were made of each criterion. The failure on any categorical test was then recorded opposite the intervals of the standard score distributions. If failures distributed throughout the range, it was obvious that there was no significant relationship. This provided a pictorial analysis of how failures on the vision tests were distributed according to success in the batting criteria. If failures concentrated at one segment of the distribution, it might be interpreted to mean that baseball players with these criterion scores were more likely to fail on that particular test than players who failed in other portions of the criterion range. This analysis indicated that no significant positive correlations were revealed in determining the relationship between batting and the categorical vision measures.

It must be remembered at the outset that the measurements obtained apply only to the universe of data indicated in this investigation. The variation in batting ability among baseball players is much narrower than it is among the random sample of boys even within comparable age and scholastic achievement levels. Boys with particular limitations in baseball ability are unlikely to be members of the team; similarly it should be expected that the differences in timing and vision are not as great in this selectively skilled group as in the general population. Individuals with marked vision deficiencies and coordination difficulties are not likely to try out for a baseball team. The fact that the individual differences which occur between the players are not significantly correlated with either timing or vision test distinctions within these same groups may be explained as follows: distinctions made by physical education and psychological tests in the upper reaches of ability tend to be less definitive than in the lower reaches; distinctions in ability between individuals in the upper reaches are more likely to be compensated for by other differences not included in the experimental conditions.

THE PROBABILITY THAT THE THREE GROUPS, (1) COLLEGE VARSITY, (2) REJECTED CANDIDATES, AND (3) NON-ATHLETES, DIFFER FROM EACH OTHER IN THEIR DISTRIBUTION ON THE TIMING AND VISION TESTS.

The latter portion of this thesis calculates the probability that groups who do not play baseball are different from groups who do, in terms of the abilities measured by the timing and vision tests used.

The scores of the high school group were omitted because of the

investigator's belief that the college individuals offered more advisable bases for comparison, in view of comparable age and scholastic achievement levels. The college varsity, rejected candidate, and non-athlete groups were all taken from the college level.

In order to determine the probability that the three groups differed significantly in their scores on the choice and directed timing tests, and all the vision tests, an application of the chi-squared technique,[8, 9] was employed. This tends to indicate that "even if the function were distributed perfectly normally in the whole population, as great a departure as was obtained or greater would occur in the samples."[10]

The application of chi-square to the problem of ascertaining whether two groups differ in their distribution of scores on a test was obtained from Garrett.[11] Table VI presents the chi-square and occurrence probabilities of the three groups on the timing and vision variable tests. The probability of group differences on the timing tests indicated significant results in all cases. The evident superiority of the varsity players over the non-athletes in the choice and directed timing tests seems to show these to be definite contributing factors to success in baseball efficiency.

$$X^2 = \frac{1}{\dfrac{E\,(a + a')(aN' - a'N)^2}{NN'}}$$

TABLE VI

THE PROBABILITY OF GROUP DIFFERENCES ON THE TIMING AND VISION VARIABLE TESTS

	Varsity and Rejected Candidates		Varsity and Non-Athletes		Rejected Candidates and Non-Athletes	
Test	X^2	P*	X^2	P*	X^2	P*
Choice Timing	6.85	.15	38.52	.00	10.56	.03
Directed Timing	10.71	.03	13.68	.01	21.81	.00
Binocular Visual Efficiency	3.86	.42	5.76	.22	1.09	.89
Visual Efficiency of Least Efficient Eye	1.55	.67	12.07	.01	2.84	.42
Stereopsis	8.29	.08	20.99	.00	13.40	.01

*P Probability that a Chi Square as large as the given one could be obtained by chance. A P less than .05 is regarded as significant. A P less than .02 is regarded as highly significant. A P greater than .05 is not significant.

8 Garrett, *op. cit.*, pp. 385-386.

9 C. C. Peters and W. R. Van Voorhis, ***Statistical Procedures and Their Mathematical Bases***, p. 418.

10 *Loc. cit.*

11 Garrett, *op. cit.*, p. 385. (See formula above.)

Differences among groups were determined for each of the vision categories. The formula used to compute chi was taken from Yule and Kendall.[12]

$$X = \sqrt{\frac{(a+b+c+d)\quad (ad-bc)^2}{(a+b)(c+d)\ (b+d)(a+c)}}$$

Since the problem dealt with two-by-two contingency tables,[13] there was one degree of freedom; chi was computed and interpreted as a standard score.

Probability of plus or minus occurrence under conditions where there is no true difference may be found by reading the value of chi as a probability in an ordinary standard score distribution.[14] Since it was necessary to know the probability of the occurrence of a chi of this size, plus or minus, this probability was doubled, following the procedure indicated by Peters and Van Voorhis.[15]

Tables VII, VIII, and IX contain the chi's and occurrence probabilities of the three groups on each of the vision category tests.

It is apparent from the obtained chi's that far point lateral imbalance and simultaneous vision tend to distinguish varsity players from rejected candidates (Table VII).

In the treatment of varsity and non-athlete groups, the calculations for lowest eye efficiency and stereopsis (both having a derived *P* of .02) confirmed the significance of these factors when treated as variables. Reliable differences were determined for near point fusion (*P* of .001) and for near point lateral imbalance (*P* of .001), indicating that scores on these tests tend to distinguish varsity players from non-athletes. The *P* of .02 for stereopsis indicates that there are only two chances in 100 that such a result could occur from fluctuations of random sampling. Passing or failing in clearness of image, far point lateral imbalance, far point fusion, vertical imbalance and binocular visual efficiency shows no apparent relation to differences between the two groups. A significant difference was revealed between the rejected candidates and the non-athletes in stereopsis (*P* of .01). All the other chi-square values revealed no significant differences.

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12 G. V. Yule, and M. G. Kendall, *An Introduction to the Theory of Statistics*. p. 432.

13 G. R. Davies, and D. Yoder, *Business Statistics*, pp. 305-307.

14 C. C. Peters, and W. R. Van Voorhis, *Statistical Procedures and Their Mathematical Bases*, pp. 485-487.

15 *Ibid.*, 419. (For $n = 1$, x is distributed as half of a normal population. So for $n = 1$, look in . . . normal distribution table . . . under $X = \frac{x}{\sigma x}$ and obtain the percentage of the distribution, then multiply this by 2. For example, $x^2 = 4$; $x = 2$; in the table for $\frac{x}{\sigma x} = 2$, $q = (.50 - .4772 = .0228$. $P = (2)(.0228) = .0456$. This is the "P" corresponding to $x^2 = 4$.

TABLE VII

THE DIFFERENCE BETWEEN VARSITY PLAYERS AND REJECTED CANDIDATES IN THE VISION CATEGORY TESTS

Test	Chi*	*P*
Lateral Imbalance (Far Point)	3.41	.001
Simultaneous Vision	2.72	.006
Near Point Fusion	-2.56	.01
Lateral Imbalance (Near Point)	1.62	.10
Far Point Fusion	1.44	.14
Lowest Eye Efficiency	.52	.61
Clearance of Image	-.24	.82
Stereopsis	-.22	.82
Binocular Visual Efficiency	.20	.84
Vertical Imbalance†		

TABLE VIII

THE DIFFERENCE BETWEEN VARSITY PLAYERS AND NON-ATHLETES IN THE VISION CATEGORY TESTS

Test	Chi	*P*
Near Point Fusion	3.20	.001
Lateral Imbalance (Near Point)	2.56	.001
Lowest Eye Efficiency	2.24	.02
Stereopsis	2.23	.02
Simultaneous Vision	2.00	.04
Clearness of Image	1.38	.16
Lateral Imbalance (Far Point)	1.33	.18
Far Point Fusion	1.34	.18
Vertical Imbalance	.98	.32
Binocular Visual Efficiency	.60	.54

TABLE IX

THE DIFFERENCE BETWEEN REJECTED CANDIDATES AND NON-ATHLETES IN THE VISION CATEGORY TESTS

Test	Chi††	*P*
Lateral Imbalance (Far Point)	-2.34	.02
Stereopsis	1.73	.08
Clearness of Image	1.23	.22
Lowest Eye Efficiency	1.20	.23
Simultaneous Vision	.85	.40
Vertical Imbalance	.64	.52
Lateral Imbalance (Near Point)	.45	.66
Far Point Fusion	.37	.72
Binocular Visual Efficiency	-.26	.80
Near Point Fusion	-.19	.84

*Negative Means that The Varsity Players Are More Apt To Fail
†Negative Means That The Rejected Candidates Are More Apt To Fail
††No Failures In This Group

CONCLUSIONS

The findings of this study warrant the following conclusions:

1. There is no significant correlation disclosed between the vision and timing tests used in this investigation and the batting criteria of batting average, slugging average, and runs batted in amongst a group of experienced baseball players.

2. Failures on the near point fusion and far point lateral imbalance categorical vision tests have little or no bearing on the batting performance measured; other forms of compensation, i.e., muscular strength, correct stance form, and proper mental attitude are probably developed to a greater degree in compensation for visual inferiority.

3. Definite differences are reliably distinguished between varsity baseball players and rejected candidates in directed timing, far point lateral imbalance, and simultaneous vision.

4. Definite differences are reliably distinguished between varsity baseball players and non-athletes in choice timing, directed timing, binocular visual efficiency, visual efficiency of least efficient eye, stereopsis, near point fusion, near point lateral imbalance and simultaneous vision.

5. Definite differences are reliably distinguished between rejected candidates for varsity baseball and non-athletes in choice timing, directed timing, stereopsis, and far point lateral imbalance.

6. The directed timing, lateral imbalance, and simultaneous vision tests tend to distinguish varsity baseball players from rejected candidates and from non-athletes.

In view of the many qualities which play important roles in the final determination of a ball player's ability and performance, it is advisable not to rely solely on the nature of psychologic tests or findings but to use these findings as corroborative information for the final decision as to acceptance or rejection of candidates.

The Importance of Providing Cumulative Sick Leave For Teachers

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FROM the point of view of teacher health, granting teachers leaves of absence to recover health is important. Any program of in-service education of teachers which fails to recognize the fundamental significance of building teachers' health is likely to disintegrate for lack of whole-hearted support of the teachers themselves. A teaching staff which is energetic vitalizes the classroom work and vitalizes the children of the school. Energy seems to be imparted and seems to have the ability of engendering energy in others. The existence of abounding energy and vigor in the teaching staff will go far toward producing the total mobilized zeal called enthusiasm. Apathy, chronic fatigue, sluggishness—these are dangerous foes of teachers which only abounding biological vigor can combat.

Costly schoolroom equipment, materials and apparatus are really of little value in the hands of tired, anaemic, unhealthy teachers. All these can be as sterile and unprofitable in the hands of such teachers, as old-fashioned textbooks and slates. The dynamic, wide-awake, healthy, well-coordinated personality is essential. Only a teacher free enough from ill health and emotional conflicts to be intelligently and constructively sensitive to the emotional needs of her pupils can meet the responsibility of present day education. We need teachers who are in the best of health in order that they may have the capacity for energy output demanded by a hard day's work. Underweight, low blood pressure, sinus trouble, diseased tonsils, colds, and indigestion are not, many times, regarded as vastly important, but they have been of great importance in the careers of teachers.[1*]

Symonds[2] believes that much of the worry and mental ill health of teachers is genuine concern over bodily weaknesses or infirmity.

In spite of the importance of teacher health in any program of education, a recent study reveals that more than one-fourth of the secondary schools have no organized program for sick leave.[3] Table I is a summary of the situation with respect to sick leaves in a representative sample of two hundred and forty-seven secondary schools of the North Central Association.

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* Superior figures refer to Bibliography at end of table.

TABLE I

SICK LEAVE IN 247 REPRESENTATIVE SECONDARY SCHOOLS OF THE NORTH CENTRAL ASSOCIATION

	Number of Schools	Per Cent
Some kind of sick leave is provided	185	74.5
Sick leave is granted up to five days	136	54.8
Sick leave is cumulative in some form	87	35.1
Sick leave is cumulative up to thirty days	33	13.3
Sick leave is cumulative up to twenty days	29	11.7
Sick leave is cumulative up to ten days	17	6.8
Sick leave is cumulative up to sixty days	8	3.2

Examination of Table I reveals that the most customary practice is to grant teachers five days (or less) of leave with pay to recover from illness. This means that in most cases teachers work in fear of ill-health knowing that even a severe cold may not only depreciate their value as teachers but, after five days, it will depreciate their income as well even though their expenses during such periods increase because of the need for medical care.

If a teacher knew that a program of cumulative sick leave were in force she would be relieved of many of the worries which beset her as she works from day to day.

Ninety-six per cent of the secondary schools included in the North Central study[4] stated that a program of cumulative sick leave was essential to teacher growth in service. Throughout the whole mass of data regarding sick leaves there was expressed definite dissatisfaction with the programs in operation. The following example is typical:

> We have never had any kind of cumulative sick leave for our teachers. As a result teachers come to school when they are physically unfit to teach and what is worse, their coming not only endangers the health and learning of pupils, but it usually sends the teacher to bed for periods exceeding our five-day limit with the result that worry over finances adds to the general problem faced by the teacher.

Why has there been so little done in secondary schools for granting teachers cumulative sick leave? Table II is a summary of the reasons assigned by the secondary schools included in the North Central study.

TABLE II

WHY SCHOOLS FAIL TO PROVIDE CUMULATIVE SICK LEAVE FOR TEACHERS

Reasons assigned	Per Cent of 247 Schools giving this reason
1. Lack of planning, no particular attention paid to the problem	31.4
2. Financial burden on the school	26.6
3. Difficulty of securing capable substitutes	18.3
4. Public not educated to the idea	12.1
5. Teachers misuse the privilege	7.3
6. Miscellaneous reasons	4.3

Certainly there is no valid excuse for the first reason. If school administrators and teachers would sit down with boards of education and consider the problem of the beneficial effects of cumulative sick leave, the most important obstacle would be easily circumvented.

For those schools which feel that the financial burden makes granting cumulative sick leaves prohibitive, the writer submits the plan used in the Galva Public Schools, Galva, Illinois, as one which will solve that problem rather easily and effectively.

In Galva the boards of education appropriate $200.00 per year for substitute teachers. There are twenty-eight members of the staff. Teachers have unlimited sick leave with no deduction from salary unless the total spent for substitutes to do the work for teachers who are ill exceeds $200.00 per year. If the total amount spent for such substitutes exceeds $200.00, the excess is prorated as a deduction in salary at the close of the year against those teachers who were absent because of illness in the ratio of the number of days absent for a given teacher to the total number of days missed by teachers due to illness. Teachers cooperate by taking other teachers' classes wherever possible. During the past six years, deductions have been made on only two occasions, and the largest deduction was $20.00 from the salary of a teacher who had missed fifty-four days of school.

An example might serve to clarify the procedure. Suppose Teacher A was absent due to illness for nine days. Suppose seven other teachers had been absent for a total of forty days. Suppose the board of education employed a substitute for forty-five days at $5.00 a day, costing a total of $225.00. The teacher who was absent for nine days would be charged with nine forty-ninths of the excess. Since the excess was $25.00, the teacher in our hypothetical case would have $4.60 deducted from her last pay check—not much financial loss for being absent nearly two weeks.

The above procedure in Galva is the result of cooperative planning between the staff, the principal, and the boards of education. Even the financial difficulties can be surmounted.

The third reason, namely, the difficulty in securing substitutes, is present whether sick leave with pay is granted or not. It is irrelevant with respect to the problem.

The fourth reason, that the public is not educated to the idea, is merely proof that there has been little planning, and the assertion that teachers misuse the privilege is likewise likely to grow out of failure on the part of the school to plan cooperatively. At any rate, the percentage is small.

SUMMARY

1. Teacher health is important and the school should be intelligently concerned with the promotion of it.

2. Granting cumulative sick leave is important for teacher health.

3. A large number of schools make little or no provision for cumulative sick leave.

4. The chief reason for the failure to provide cumulative sick leave is lack of cooperative planning.

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2. Symonds, P. M., "Problems Faced by Teachers," *Journal of Educational Research* (Sept., 1941), 35:14.
3. Weber, C. A., *Technique Employed in a Selected Group of Secondary Schools of the North Central Association for Educating Teachers in Service*, Doctoral Dissertation (Northwestern University, 1942), p. 214.
4. *Loc. cit.*

Test Results of The University of Michigan Physical Conditioning Program June 15---September 26, 1942

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THIS report presents an analysis of the results of a series of physical performance items given at the beginning of a physical conditioning program and given again at the end of the period.* The program began June 15 and ended September 26, 1942; testing was done during the weeks of June 15 and of August 31. The purpose of the tests was to obtain data which would permit an appraisal of the amount of change in physical performance with the inference that these changes would be attributable to activities which constitute the program and would provide an estimate of the progress toward better or adequate physical condition. It is admitted that the concept of physical condition does not easily lend itself to precise definition and, at the moment, the development of the definitive thesis is more academic than useful. The connotation of the term is sufficiently clear, I believe, to be used here without further discussion.

The test items follow: standing height to nearest quarter inch, weight to nearest pound, maximum strength of right and left grip to nearest kilogram, number of complete pull-ups or chins, number of complete push-ups from the floor, the difference between the reach and the jump and reach or vertical jump to nearest inch, standing broad jump from four-inch height, time for sixty-yard, straight-a-way sprint, and the time for four hundred-forty-yard run with two turns.†

The accuracy requirement for all testing was satisfactorily, although not ideally, fulfilled. The interest of the majority of students was good and their performance maximal both in the pre-test and in the post-test. A small group, estimated to vary between 8 and 15 per cent of the total, did not give maximal performances in either set

* In a very real sense the author of this paper is not myself. The credit should largely go to the members of the staff of physical education and intercollegiate athletics. They did the work of planning and administering the program and the accomplishment and high morale of the students is a tribute to their efforts. To all of these, acknowledgments are made.

† The body of the report does not contain any statement about swimming. The accomplishment in this area was major. Twenty per cent of the total group could not swim at the beginning of the program. At the end of the program there were *no non-swimmers;* that is, every student could swim a distance of one hundred yards and could stay afloat for five minutes.

of tests. The subsequent analysis presents the findings on this group and provides interesting evidence on the relation of attitude to performance. The pre-test battery was divided into two groups and administered on different days. The order was: strength of right and left grip, number of pull-ups, number of push-ups, and vertical jump on the first day; and, standing broad jump, sixty-yard sprint, and four hundred-forty-yard run on the second day. There was no rest between the events given on the first day while there were adequate recovery priods between the events given on the second day. All items of the post-test were given on the same day with about twenty minutes elapsing between the beginning and end of the test battery. This testing procedure minimizes rather than maximizes the values and gives us assurance of not overstating our results.

The population is composed of male students at the University of Michigan enrolled during the first semester (summer) of the academic year 1942-1943. All participants presented medical evidence of satisfactory constitution and may be classified as "able-bodied." The total sample number is 1,920; of these 1,141 had complete pre-test and post-test records and were subject to the same conditioning program; the remainder presented either incomplete test records or had been subjected to a somewhat different conditioning program. (These latter were mainly professional students in Medicine and Dentistry.) The analysis, then, is based upon a sample of over a thousand with testing and analytical requirements satisfactorily fulfilled.

The average age is 21.65 years, the range from 17 to 34 years, with 91 per cent falling between the ages of 19 and 25 years.

The results of the pre-test are contained in Table I. The averages (means) of height and weight are similar to the corresponding averages for students in other Universities in the United States. There are some minor regional differences shown but these are not sufficiently important to be elaborated here. The students are significantly taller and heavier than corresponding males in the population as a whole and are somewhat less variable. (As measured by the standard deviation, S.D., and the coefficient of Variation, V.)

Usual laterality differences are shown in the strength of right and left grip ($d = 3.34$ kilograms). No comparison may be made with other university students since dynamometers are not comparable. (We used Stoelting instrument with the adjustable grip in contrast with the more widely used Narrangansett non-adjustable dynamometer. On a series of 100 readings during the past three months the writer averaged 65.8 kilograms on the Stoelting instrument and 121.5 lbs. on the Narrangansett instrument, a difference of 23.26 pounds). This group is significantly stronger in both right

and left grip than comparable non-university males from southern Michigan.[1]

The number of pull-ups, of push-ups, the height of the vertical jump, the distance of standing broad jump, and the four hundred-forty-yard-run compare favorably with like figures (as yet unpublished) coming in from other universities with most differences of questionable significance. Comparisons with non-university males cannot be made. The published standards of Cozens[2], enables us to estimate whether this group of performances may be considered adequate. In terms of these standards, deficiencies range from 2 to 22

TABLE I

RESULTS OF PRE-TEST

Event	Mean ± e	S. D.	V.	Range
Stature	68.99 ± 0.06	2.46	3.57	61-78
Weight	155.22 ± 0.46	19.05	12.27	95-265
Right Grip	56.77 ± 0.19	7.87	13.86	30-83
Left Grip	53.43 ± 0.18	7.21	13.49	30-80
Pull-ups	7.45 ± 0.08	3.46	46.50	0-24
Push-ups	15.93 ± 0.16	6.45	40.48	1-48
Vertical Jump	19.52 ± 0.07	2.85	14.60	9-30
60-Yard Run	8.03 ± 0.02	0.54	6.72	6.6-10.4
440-Yard Run	74.05 ± 0.20	7.24	9.78	54-130
Broad Jump	91.64 ± 0.28	8.87	9.68	60-120

percentile ranks and force the conclusion that there is a clear-cut deficiency in performance and enable the inference that this deficiency is a reflection of lack of physical condition. Comparisons for the sixty-yard sprint cannot be made.

To summarize:

1. Students at the University of Michigan are not markedly different from students in other American universities.

2. They are taller, heavier, stronger, and, by inference, probably better physical performers than comparable non-university males.

3. Their performance is unsatisfactory as measured by Cozen's standards, and

4. Their inadequacy in performance may be attributed to lack of physical condition.

The results of the post-test are contained in Table II, and the amount and significance of differences between the pre-test and post-test are shown in Tables III, IV, and V. Stature, for obvious reasons, was not remeasured. The increase in average weight is

1 Unpublished data of the author. The differences are 2.24 kilos for the right hand and 2.06 kilos for the left hand.

2 Frederick W. Cozens, *Achievement Scales in Physical Education Activities for College Men.* (Philadelphia: Lea and Febiger, 1936).

small and not significant. The reduction in weight variability is significant, and is ascribed to considerable loss of weight among heavy individuals and to some weight gain among slender individuals. This point will be elaborated later. The changes in all performance items are positive and, with the exception of the standing broad jump, marked. The probability (P) of non-significance of these changes is less than 1 in 1,000 for all events but standing broad jump. Columns d/S.D. (the difference between pre-test and post-test averages divided by the standard deviation of the pre-test) and T. Percentile (the fractional part of the total area under the normal probability curve corresponding to distances on the baseline between the mean and successive points laid off from the mean in units of standard deviation) are techniques for estimating the amount of change which has occurred in the several events between the pre- and post-tests. When the T. Percentile value reaches 50.00 it means that the lowest man in the second test is equal to or better than the highest man in the first test. The average of these values (M = 16.69) divided by 50 gives 33.38 per cent which may be taken as one estimate of the amount of improvement attributable to the conditioning program. Another estimate of improvement is contained in Table III which shows where the average man (the one at the 50 percentile) on the post-test would be in the pre-test distribution. For all events the average man in 19.63 percentile ranks better at the end than at the beginning and we may say, in a very rough way, that our average man has improved 20 per cent. Table V is a crude and approximate way of using standards; it does enable us to state that if 50 is the standard for adequate performance our group has changed from unsatisfactory to satisfactory.

TABLE II

RESULTS OF POST-TEST

Event	Mean ± e	S. D.	V.	Range
Stature	not remeasured			
Weight	155.32 ± 0.62	17.40	11.20	110-223
Right Grip	59.86 ± 0.27	7.83	13.08	35-86
Left Grip	55.67 ± 0.26	7.61	13.67	33-82
Pull-ups	10.20 ± 0.14	3.99	39.12	0-48
Push-ups	21.18 ± 0.22	6.51	30.73	2-84
Vertical Jump	20.25 ± 0.10	3.01	14.86	10-30
60-Yard Run	7.92 ± 0.017	0.48	6.06	6.2-9.9
440-Yard Run	68.30 ± 0.20	5.68	8.32	55-97
Broad Jump	92.01 ± 0.27	7.94	8.63	66-122

TABLE III

SIGNIFICANCE OF DIFFERENCES

PRE-TEST AND POST-TEST

Event	Pre-test	Post-test	d	P	d/S.D.	T Percentile*
Weight	155.22	155.32	+0.10	.900	.005	0.20
Right Grip	56.77	59.86	3.09	.001	.392	15.24
Left Grip	53.43	55.67	2.24	.001	.311	12.11
Pull-ups	7.45	10.20	2.75	.001	.795	28.66
Push-ups	15.93	21.18	5.25	.001	.813	29.16
Vertical Jump	19.52	20.25	0.73	.001	.256	10.07
60-Yard Run	8.03	7.92	0.11	.001	.204	8.07
440-Yard Run	74.05	68.30	5.70	.001	.787	28.43
Broad Jump	91.64	92.01	0.37	.400	.042	1.67

* T Percentile is the fractional part of the area under the normal probability curve given by the quotient of the difference between two means (d/S.D.) divided by the standard deviation of the first mean. When this value reaches 3.00 the area under the curve is 49.86 per cent. The maximum which may be attained is 50.00 per cent.

TABLE IV

PERCENTILE RANK CHANGE

The *Average Man,* at the end of the Summer Program, was equalled or exceeded by *per cent* of group in *event* at the beginning of Summer.

Per Cent	Event	Change to Percentile
16	Pull-ups	84th
16	Push-ups	84th
29	Right Grip	71st
30	Left Grip	70th
31	Vertical Jump	69th
24	440 Yards	76th
48	60 Yards	52nd
49	Broad Jump	51st
		Average = 19.63

TABLE V

SCORE CHANGE

(According to Cozens)

Approximate

	Pre-test	Post-test	Difference
Pull-ups	41	54	13
Push-ups	38	52	14
440-Yard Run	37	57	20
Broad Jump	50	52	2
Vertical Jump	48	54	6

To summarize:

1. Physical performance, and by implication physical condition, has been markedly improved and the *major purpose of the program has been fulfilled.*

2. The group as a whole rather than a fraction of the group has gained, revealing that another purpose of the program has been fulfilled, namely, *to aid all individuals in the attainment of better physical condition rather than to specialize in the refinement of those who have marked physical ability.* (The figures on individual improvement, in excess of 90 per cent, make this latter statement incontestable.)

3. The amount of improvement, for those who prefer to think in terms of percentages, is not less than 20 per cent.

The analysis of pre-test performance in terms of the Height-Weight groupings of Cozens[3] is contained in Tables VI-XII, the summary of the averages is shown in Table XIII, and the summary of the standard deviations is presented in Table XIV. Cozens states, "The tall men as a group are superior to those who are short. Particularly is this true in events requiring arm and shoulder-girdle coordination, jumping and leg strength, endurance and body coordination."[4] Our data show superiority of tall over short in all events but pull-ups and push-ups; here there is a clear-cut inferiority. "Of the tall men the slenders are definitely handicapped in regard to all-around performance."[5] This statement is substantiated with the exception of pull-ups which reveal the tall heavy to be deficient to the tall slender. "There is no distinction in all-around performance between the tall medium group and the tall heavy group."[6] Our findings do not agree: the tall medium are deficient to the tall heavy in strength of right grip ($d = 3.98$ kg.) and present performance excesses, although small, in all other items. "The medium height group is definitely superior to the short group. Here again the slenders seem to be handicapped and do not compare favorably with the mediums and heavies."[7] Our results agree, with the major exception in number of push-ups which present a general superiority of short over medium and tall groups. Other minor differences are apparent (Table XIII). The medium groups are generally intermediate to the tall and short in the several weight divisions and in the different performances.

3 Cozens, *op. cit.*, p. 9.
4 *Ibid.*, p. 10.
5 *Ibid.*, p. 10.
6 *Ibid.*, p. 10.
7 *Ibid.*, p. 11.

TABLE VI
PRE-TEST — RIGHT GRIP

Subgroup	Per Cent of Total	Range	Mean ± e	S. D.	C. V.
Tall Heavy	12.44	35-81	62.11 ± 0.59	7.81	12.57
Medium Heavy	26.55	34-80	58.54 ± 0.37	7.22	12.33
Short Heavy	6.15	35-71	55.07 ± 0.78	7.24	13.15
Tall Medium	13.42	35-80	58.13 ± 0.60	8.31	14.29
Medium Medium	27.20	35-76	56.06 ± 0.36	7.07	12.61
Short Medium	5.22	35-66	50.24 ± 0.73	6.31	12.56
Tall Slender	3.04	36-66	53.80 ± 0.83	5.41	10.06
Medium Slender	4.72	37-65	50.47 ± 0.69	5.70	11.29
Short Slender	1.26	37-56	50.05 ± 1.14	4.82	9.63

TABLE VII
PRE-TEST — PULL-UPS

Subgroup	Range	Mean ± e	S.D.	C.V.
Tall Heavy	0-15	5.67 ± 0.26	3.41	58.09
Medium Heavy	0-24	7.26 ± 0.24	3.46	47.66
Short Heavy	0-16	7.63 ± 0.35	3.16	41.42
Tall Medium	0-18	7.29 ± 0.21	2.82	38.65
Medium Medium	1-23	9.02 ± 0.23	3.47	38.47
Short Medium	4-19	9.00 ± 0.42	3.42	38.00
Tall Slender	1-16	6.79 ± 0.48	3.26	48.01
Medium Slender	3-18	8.95 ± 0.46	2.84	31.73
Short Slender	2-14	8.19 ± 1.01	4.05	49.45

TABLE VIII
PRE-TEST — PUSH-UPS

Subgroup	Range	Mean ± e	S. D.	C. V.
Tall Heavy	1-42	14.50 ± 0.46	6.09	42.00
Medium Heavy	4-37	16.50 ± 0.43	6.17	37.39
Short Heavy	8-46	18.30 ± 0.76	6.21	33.93
Tall Medium	2-33	14.94 ± 0.40	5.52	36.95
Medium Medium	4-50	17.51 ± 0.40	6.02	34.38
Short Medium	6-48	18.30 ± 0.80	7.19	39.29
Tall Slender	1-26	13.15 ± 0.84	5.67	43.11
Medium Slender	6-31	15.75 ± 0.83	5.24	33.26
Short Slender	6-23	15.63 ± 1.34	5.37	34.35

TABLE IX
PRE-TEST — VERTICAL JUMP

Subgroup	Range	Mean ± e	S. D.	C. V.
Tall Heavy	11-26	19.21 ± 0.20	2.62	13.64
Medium Heavy	9-28	19.15 ± 0.15	2.91	15.20
Short Heavy	13-26	18.72 ± 0.34	3.21	17.15
Tall Medium	11-30	20.01 ± 0.22	2.94	14.69
Medium Medium	10-26	19.47 ± 0.14	2.69	13.82
Short Medium	11-24	18.45 ± 0.33	2.82	15.28
Tall Slender	13-24	19.13 ± 0.39	2.65	13.85
Medium Slender	11-26	18.32 ± 0.35	2.86	15.61
Short Slender	12-24	19.42 ± 0.96	3.96	20.39

TABLE X

PRE-TEST — 60-YARD DASH

Subgroup	Range	Mean ± e	S. D.	C. V.
Tall Heavy	6.7-9.8	8.11 ± 0.045	0.57	7.03
Medium Heavy	6.9-9.9	8.08 ± 0.028	0.52	6.44
Short Heavy	7.2-9.8	8.27 ± 0.064	0.55	6.65
Tall Medium	6.9-9.5	8.00 ± 0.038	0.48	6.00
Medium Medium	6.7-9.5	8.00 ± 0.029	0.54	6.75
Short Medium	7.2-9.4	7.82 ± 0.061	0.49	6.27
Tall Slender	7.2-9.5	8.20 ± 0.080	0.50	6.09
Medium Slender	7.2-9.5	8.21 ± 0.068	0.52	6.33
Short Slender	7.2-9.5	8.32 ± 0.160	0.60	7.21

TABLE XI

PRE-TEST — 400-YARD RUN

Subgroup	Range	Mean ± e	S. D.	C. V.
Tall Heavy	59-99	73.66 ± 0.53	6.59	8.95
Medium Heavy	59-116	74.32 ± 0.35	6.55	8.81
Short Heavy	59-99	76.22 ± 0.79	6.95	9.11
Tall Medium	59-92	72.12 ± 0.47	5.87	8.14
Medium Medium	58-102	72.47 ± 0.32	5.78	7.98
Short Medium	62-95	75.47 ± 0.71	5.69	7.54
Tall Slender	63-91	73.96 ± 0.93	5.78	7.81
Medium Slender	61-99	74.45 ± 0.89	6.69	8.98
Short Slender	63-92	76.93 ± 1.72	6.43	8.36

TABLE XII

PRE-TEST — STANDING BROAD JUMP

Subgroup	Range	Mean ± e	S. D.	C. V.
Tall Heavy	66-113	93.26 ± 0.68	8.60	9.22
Medium Heavy	66-120	94.39 ± 0.48	9.01	9.55
Short Heavy	70-112	88.77 ± 1.06	9.10	10.25
Tall Medium	66-118	94.08 ± 0.70	8.87	11.97
Medium Medium	66-120	93.03 ± 0.42	7.79	8.37
Short Medium	70-107	88.25 ± 0.98	7.92	8.97
Tall Medium	73-105	90.65 ± 1.13	7.06	7.79
Medium Slender	70-107	89.60 ± 1.03	7.82	8.73
Short Slender	70-106	88.21 ± 2.77	10.38	11.77

A study of the averages in the different height-weight combinations has shown many significant performance differences indicating classification of men into H-W groups to serve useful purposes. A second consideration of grouping is variability, both within groups and between groups; that is, to answer the question: Is the difference in performance of individuals within a classified group less than, equal to, or greater than, the difference in performance in the total group within which subgroups are established? Table XIV provides a summary of evidence bearing on this question. The average of the standard deviations in all events for the

total group is 5.14. The corresponding averages for the Height-Weight groups are: Tall Heavy—5.10, Medium Heavy—5.12, Short Heavy—5.20, Tall Medium—4.97, Medium Medium—4.77, Short Medium—4.84, Tall Slender—4.33, Medium Slender—4.52, and Short Slender—5.09. If we express these as percentages of the total variation we note total average reduction in variability is 5.02 per cent; in the heavy groups the reduction is 0.00 per cent; in the medium groups the reduction is 5.45 per cent; and in the slender groups the reduction is 9.60 per cent. Considering height independent of weight we obtain an average reduction of 5.06 per cent, distributed: Tall—6.62 per cent; Medium—6.62 per cent, and Short —1.95 per cent. Considering weight independent of height the average reduction is 5.00 per cent distributed: Heavy—0.00 per cent; Medium—5.45 per cent, and Slender—9.54 per cent.

To summarize:

1. The effect of classification into height-weight groups is to produce small but significant differences in performance and to reduce the variability or difference in performance by an appreciable percentage.

More important from the standpoint of the conditioning program is an answer to the question: Is there a difference in the "conditionability" in the height-weight subgroups? The detailed examination of differences between pre- and post-test within the height-weight groups clearly shows a greater improvement of the slender groups in all events. The improvement differences between the medium and the heavy groups are erratic and of questionable significance. From the standpoint of height there is some evidence of more improvement in the short than in the medium and in the tall groups.

To summarize:

1. Evidence, more suggestive than striking, indicates a slightly greater improvement in the slender and in the short groups.

Tables XV and XVI present the detailed analysis of performance change in the several subgroups and in the total group in terms of gain or loss in weight. Two points become established: 1) In the heavy groups there is a gain in performance with a loss in weight; and 2) in the slender groups there is a gain in performance with a gain in weight. In the medium groups the changes are erratic.

TABLE XIII

SUMMARY OF HEIGHT-WEIGHT AVERAGES

	Tall	Medium	Short	
Right Grip	62.11	58.54	55.07	Heavy
	58.13	56.06	50.24	Medium
	53.80	50.47	50.05	Slender
Pull-ups	5.87	7.26	7.63	Heavy
	7.29	9.02	9.00	Medium
	6.79	8.95	8.19	Slender
Push-ups	14.50	16.50	18.30	Heavy
	14.94	17.51	18.30	Medium
	13.15	15.75	15.63	Slender
Vertical Jump	19.21	19.15	18.72	Heavy
	20.01	19.47	18.45	Medium
	19.13	18.32	19.42	Slender
60-Yard Dash	8.11	8.08	8.27	Heavy
	8.00	8.00	7.82	Medium
	8.20	8.21	8.32	Slender
440-Yard Run	73.66	74.32	76.22	Heavy
	72.12	72.47	75.47	Medium
	73.96	74.45	76.93	Slender
Broad Jump	93.26	94.39	88.77	Heavy
	94.08	93.03	88.25	Medium
	90.65	89.60	88.21	Slender

TABLE XIV

SUMMARY OF STANDARD DEVIATIONS

	Tall	Medium	Short	
Right Grip	7.81	7.22	7.24	Heavy
	8.31	7.07	6.31	Medium
	5.41	5.70	4.82	Slender
Pull-ups	3.41	3.46	3.16	Heavy
	2.82	3.47	3.42	Medium
	3.26	2.84	4.05	Slender
Push-ups	6.09	6.17	6.21	Heavy
	5.52	6.02	7.19	Medium
	5.67	5.24	5.37	Slender
Vertical Jump	2.62	2.91	3.21	Heavy
	2.94	2.69	2.82	Medium
	2.65	2.86	3.96	Slender
60-Yard Dash	0.57	0.52	0.55	Heavy
	0.48	0.54	0.49	Medium
	0.50	0.52	0.60	Slender
440-Yard Run	6.59	6.55	6.95	Heavy
	5.87	5.78	5.69	Medium
	5.78	6.69	6.43	Slender
Broad Jump	8.60	9.01	9.10	Heavy
	8.87	7.79	7.92	Medium
	7.06	7.82	10.38	Slender
Average	4.80	4.80	5.04	

AVERAGE—Heavy = 5.14 Medium = 4.86 Slender = 4.65

TABLE XV

CHANGE IN WEIGHT AND CHANGE IN PERFORMANCE IN HEIGHT-WEIGHT GROUPS

(*Rank Order*)

Change in Weight	Per Cent of Total	Pull-ups	Push-ups	Right Grip	Vertical Jump	440 Yards	60 Yards	Standing Broad Jump	Aver. Rank
Tall Heavy									
±2 lbs.	35.80	3	3	3	2	3	2	3*	2.71
3 — 5	18.52	2	1	2	1	2	3	5*	2.29
6 — x	17.28	5	4	4	5*	5	5*	4*	4.57
—3—5	17.28	4	2	1	4*	4	4	2	3.00
—6—x	11.11	1	5	5	3	1	1	1	2.43
Medium Heavy									
±2 lb.	43.45	4	5	2	5	5	3	4*	4.00
3 — 5	11.72	5	4	4	3	2	2	3	3.29
6 — x	11.72	3	3	3	1	4	5	5*	3.42
—3—5	18.62	2	2	5	2	3	4	2	2.86
—6—x	14.48	1	1	1	4	1	1	1	1.43
Short Heavy									
±2 lb.	34.48	3	2	4	3*	1	2	2	2.57
3 — 5	20.69	4	3	1	2	5	5*	1	3.00
6 — x	6.90	1	5	5	4*	2	1	5	3.29
—3—5	27.59	2	4	2	1	4	3	3	2.71
—6—x	10.34	5	1	3	5*	3	4	4*	3.57

Change in Weight	Per Cent of Total	Pull-ups	Push-ups	Right Grip	Vertical Jump	440 Yards	60 Yards	Standing Broad Jump	Aver. Rank
Tall Medium									
±2 lbs.	49.46	5	5	2	3	2	2	2	3.00
3 — 5	24.73	3	4	1	2	3	1	1	2.11
6 — x	11.83	2	2	3	1	1	4	4*	2.43
—3—5	10.75	4	3	4	4	4	3	3	3.57
—6—x	3.23	1	1	5*	5	5	5*	5*	3.86
Medium Medium									
±2 lbs.	47.57	5	5	4	4	2	2	2	3.43
3 — 5	25.95	3	4	3	3	3	1	3	2.86
6 — x	17.84	2	3	2	2	5	4	5	3.29
—3—5	7.03	4	1	1	5	4	5	4	3.43
—6—x	1.62	1	2	5	1	1	3	1	2.00
Short Medium									
±2 lbs.	58.82	4	2	2	3	4	1	4	2.86
3 — 5	17.65	2	4	1	4*	1	3	1	2.29
6 — x	14.71	1	3	4	1	2	4*	2	2.43
—3—5	8.82	3	1	3	2	3	2	3	2.43
—6—x	0.00								

Change in Weight	Per Cent of Total	Pull-ups	Push-ups	Right Grip	Vertical Jump	440 Yards	60 Yards	Standing Broad Jump	Aver. Rank
Tall Slender									
±2 lbs.	36.36	2	4	3	4	4	2	1	2.86
3 — 5	27.27	4	2	2	1	3	3	2	2.43
6 — x	18.18	1	1	4	2	2	1	4	2.14
–3–5	18.18	3	3	1	3	1	4	3	2.57
–6–x	0.00								
Medium Slender									
±2 lbs.	38.71	4	2	2	2	3	3	4	2.86
3 — 5	25.26	3	1	1	1	1	4	3	2.00
6 — x	32.26	2	3	3	3*	2	1	2	2.29
–3–5	3.22	1	4	4	4*	4	2	1	2.86
–6–x	0.00								
Short Slender									
±2 lbs.	30.00	2	2	3	2	2	2	1	2.00
3 — 5	50.00	3	3	1	3	1	1	2	2.00
6 — x	20.00	1	1	2	1	3	3*	3	2.00
–3–5	0.00								
–6–x	0.00								

TABLE XVI

CHANGE IN WEIGHT AND CHANGE IN PERFORMANCE

(*Rank Order*)

Change in Weight	Per Cent of Total	Pull-ups	Push-ups	Right Grip	Vertical Jump	440 Yards	60 Yards	Standing Broad Jump	Aver. Rank
±2 lbs.	44.28	4	5	3	4	4	3	4	3.86
3 — 5	21.27	3	4	1	3	2	2	2	2.43
6 — x	15.56	2	3	5	1	5	4	5	3.57
–3–5	12.70	5	2	2	2	3	5	3	3.29
–6–x	6.19	1	1	4	5	1	1	1	2.00

Table XVII compares the average gains and losses between those groups that were on a 3-hour per week program with those (Other) who were on a 4.5-hour per week program. There was an average gain in weight of 1.46 pounds among 3-hour students against an average loss of weight of 0.37 pounds in Other, 2. The gain in the several performances among 3-hour students is 69.09 per cent of the gain in Other. Expressed differently the figures show that the *amount of gain is directly proportional to the amount of time spent in the program.*

TABLE XVII

AVERAGE GAINS AND LOSSES
3-Hour Students and 4.5-Hour Students

	N.	Height	Weight	Pull-ups	Push-ups	R. Grip	L. Grip	V. Jump	440 Yd.	60 Yd.	B. Jump
3.0 Hour Students (A):											
Post-Test	37	69.31	155.35	10.14	21.24	58.76	55.78	20.24	68.51	7.98	94.00
Pre-test	37	——	153.26	8.12	16.91	56.02	53.50	19.26	72.60	8.13	92.42
d	—	——	+2.09	+2.02	+4.33	+2.74	+2.28	+0.98	+4.11	+0.15	+1.58
3.0 Hour Students (B):											
Post-test	262	69.04	156.25	8.89	20.15	59.13	56.02	20.08	69.05	7.99	90.95
Pre-test	262	——	154.79	6.95	16.21	56.52	52.88	19.37	73.15	8.10	91.46
d	——	——	+1.46	+1.94	+3.94	+2.61	+3.14	+0.71	+4.10	+0.11	—0.51
4.5 Hour Students:											
Post-test	842	68.97	154.96	10.80	21.65	60.19	55.51	20.33	67.97	7.89	92.49
Pre-test	842	——	155.33	7.57	15.85	56.84	53.57	19.56	74.29	8.01	91.69
d	——	——	—0.37	+3.23	+5.80	+3.35	+1.94	+0.77	+6.32	+0.12	+0.80

Samplings of student attitude were taken throughout the summer. The findings are important. There were never less than 70 per cent of the students who were favorable (i.e. enjoyed) to the program and never more than 16 per cent who disliked the program. The findings from two small samples of dislike ($N = 11$ and 19 respectively) are *strongly suggestive* although not conclusive. This group of 30 showed an average gain of only 18.2 per cent of those who enjoyed the program. This presents a strong warning to those who administer a program: The attitude of students should be closely watched and carefully guarded. They must be *interested* or the administrator is confronted with an 81.8 per cent loss of efficiency in the production of physical condition.

In conclusion, the analysis clearly shows:

1. The inadequate performance of the average university male when left to his own devices for the maintainance of physical education.

2. That a well-ordered conditioning program can and has produced acceptable (i.e. at Percentile Rank of 50 or greater in performance standards) physical condition in a period of 16 weeks at 4.5 hours per week.

3. That 3 hours per week for 16 weeks produced only 69.0 per cent as much gain as 4.5 hours per week.

4. That the major changes are shown in those events which place heavier demands upon "physical condition"—pull-ups, push-ups, 440-yard run and mile run—and the minor changes are shown in those activities which place a higher premium upon "non-endurance," and more on "explosive power," strength of grip, vertical jump, 60-yard dash, broad jump.

5. That a total average gain of approximately 20 per cent is directly attributable to the program as administered and represents a major accomplishment.

6. That the maintainance of a favorable attitude on the part of those taking the program should be considered as requisite.

A Simple, Economical, and Valid Administrative Ability-Grouping of High School Boys For Physical Education

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PURPOSE OF THE STUDY

A PREVIOUS study[1] in administrative grouping of high school boys indicates that a primary grouping into thirds and a secondary sectioning of thirds into halves on the basis of Rogers' Strength Index was a preferred procedure. A second choice was primary grouping by Strength Index and secondary grouping by MacCurdy's Physical Capacity Index. The theory back of such administrative grouping is that, by grouping pupils by one factor at a time, the effect of each classifier will be to produce a homogeneity in that factor. Thus if hulk and maturity (C. I. for example) were one factor and dynamic strength (L. D. S. T., e. g.) another, administrative grouping by these two factors would produce no overlapping in either factor in successive groups. Such homogeneity does not exist when two or more factors are statistically combined, and ability sections formed from this combination.

It is the purpose of this study to produce an administrative classification of high school boys by two disparate factors which shall have a validity comparable to or greater than that of previously recommended groupings and yet be easier to administer and more economical from the standpoint of cost and time.

CRITERIA FOR EVALUATION OF ADMINISTRATIVE GROUPINGS

These shall be the same as were employed in the above-mentioned study.[2] They are, in order of importance:

1. Correlation with the criterion of performance—each classifier should have considerable correlation with the criterion of physical education performance.

2. Regularity of increment—successive groups formed by this

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1 Karl W. Bookwalter, *A Critical Evaluation of the Application of Some of the Existing Means for Classifying Boys for Physical Education Activities.* (A Doctor's Dissertation, School of Education, New York University, 1938) p. 228.

2 *Ibid.*, pp. 202-207.

procedure should have progressively higher averages in performance in the criterion.

3. Reliable critical ratios—the critical ratios of the differences between average performances of successive or adjacent groups should equal or exceed 2.5; that is, be statistically reliable.

4. Average of critical ratios—while two groupings may have an equal number of significant critical ratios, that one having the highest average critical ratio will, other things being equal, be superior.

5. Average difference in criterion performances—the wider the differences between the average performances of consecutive or adjacent groups, the more homogeneous such groups must of necessity be.

6. Administrative difficulty of measures—may be determined by the number of items to be administered and also by the simplicity of these items.

7. Essential contributing factors involved—recent factor analysis studies[3] reveal rather conclusively that *a*) strength, *b*) velocity, *c*) dead weight, *d*) motor ability, and *e*) height, in the order named, contribute to successful performance in physical education activities. Accordingly, other things equal, those classifiers are preferred which involve all or most of these factors.

8. Average variability of groups—since the essence of classification is homogeneity, that grouping productive of the least variability is best. The coefficient of variability (V) will be considered a criterion of this condition; the smaller the "V" the more homogeneous the group.

9. Correlation between classifiers should be small; otherwise, each factor tends to repeat the other.

PROCEDURE

The Criterion of Physical Performance was selected so as to obtain elements frequently employed as measures of factors known to contribute to successful performance in physical education activities: 1) Burpee Test (stand-squat-front support-squat-stand for 10 seconds) is a measure of agility or large muscle coordination and speed; 2) standing broad jump is a measure of velocity; 3) fifty-yard dash is a measure of velocity or speed (if a difference may be drawn); 4) pole climb is a measure of arm and leg strength; 5) football punt measures hand-eye, foot-eye coordination; 6) shot-put is variously considered as a reflection of strength, velocity, and/or weight, and/or height; 7) baskets per minute reflect hand-eye coordination and speed of ball handling. Collectively these elements give a rather generous sampling of the most frequently isolated factors contributing to successful physical performance. From 663 to 717 high school boys were given the criterion and classifying

[3] Karl W. Bookwalter, "A Survey of Factor Analysis Studies in Physical Education," *The Physical Educator*, 2, No. 5, pp. 209-212.

measures. The elements were first scored on the scale scores for the pupil's respective age-height-weight classifications according to Cozens, Trieb, and Neilson[4] Best Fit Index. Results from such scoring proved futile due to the fact that the influence of age, height, and weight is thereby held constant. Accordingly, modified *T*-scores (600/100) were computed for each element for the total sampling. The criterion herein employed is the sum of the seven element scores thus obtained.

The Classifiers—Since the purpose of this study was to simplify existing accepted[5] and recommended administrative groupings, the present authors went directly to two diverse and accepted *simple* classification measures, namely: 1) McCloy's Classification Index (20 age + 6 ht. + wt.),[6] and 2) Larson's Springfield Dynamic Strength Test[7] (weighted chinning, dipping, and vertical jump). The former, a measure of athletic power, is a combination of bulk and maturity factors which has been shown to have validity as a classifier for physical education activities. Height and weight are factors of importance in several factor analysis studies. In addition to this *functional* relationship the index can logically be shown to contribute to *safety* by equalization of size of participants and to *motivation* by producing a more psychologically and socially sound grouping of students. McCloy has advised that his index be employed in conjunction with other tests or measures.

Larson's Springfield Dynamic Strength Test is an established measure of strength as evidenced in handling the body as a weight. This measure tends to be inverse to C. I. especially in the upper levels of C. I. It is this factor which differentiates between the big man and the "good big man" and it was considered by the authors to be the more functional of the two classifiers. The diversity of these two factors is exemplified in their r of .262 ± .035 (obtained in the present study).

That the latter strength test *is* more functional than McCloy's C. I. is exemplified by the present correlations of .639 ± .025 and .376 ± .033 obtained between the present criterion and these two classifiers respectively.

If these values of *safety, motivation,* and *functional grouping* can be obtained from the six simple measures a) age, b) height, c) weight, d) chinning, e) dipping, and f) vertical jump, it would seem that at last a valid procedure is available which is economical of time

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4 N. P. Neilson, *Physical Education Achievement Scales for Boys in Secondary Schools.* (New York: A. S. Barnes and Company, 1936), p. 13.

5 Karl W. Bookwalter, *A Critical Evaluation of the Application of Some of the Existing Means for Classifying Boys for Physical Education Activities,* p. 228.

6 C. H. McCloy, *Measuring Athletic Power.* (New York: A. S. Barnes and Company, 1932), p. 96.

7 Leonard A. Larson, "A Factor and Validity Analysis of Strength Variables and Tests With a Test Combination of Chinning, Dipping, and Vertical Jump," RESEARCH QUARTERLY, 4 (1940) 82.

and equipment and which is within the capacity of any sincere and interested teacher to administer. The extremely high validity of this simple combination of classifiers as compared with other accepted but more complex measures is clearly established below.

THE RECOMMENDED ADMINISTRATIVE GROUPING

Figure I, below, graphically illustrates the administrative grouping concept and also contains the statistical proofs for the validity

Figure 1. Criterion Scores of Primary Groupings Into Population Thirds by Larson's Dynamic Strength Test and Secondary Groupings by Meanpoints of McCloy's Classification Index for Senior High School Boys

and reliability of the present study. Readers should *not* confuse the simple application of administrative grouping procedure with this accompanying statistical analysis and proof.

COMPARISONS OF ADMINISTRATIVE GROUPINGS

The Classification Index and Best Fit Index were both employed in combination with Larson's Dynamic Strength Test but the first two were not taken together or separately as classifiers since the purpose of this study was to employ *diverse* measures in administrative combination. The following combinations were tested for validity:

Primary Classifier	*Secondary Classifier*
1 (B. F. I.)	3 (L. D. S. T.)
2 (C. I.)	3 (L. D. S. T.)
3 (L. D. S. T.)	1 (B. F. I.)
3 (L. D. S. T.)	2 (C. I.)

For comparison, the evaluative criteria for the proposed combinations are shown in Table I together with the selected combinations for high school boys as given in the former study by Bookwalter.

The criterion of performance employed in the present study is *not* that which was utilized in the previous study. It is comparable in its variety; it is equal in the number of items included; and finally, for the purpose of this study, the omission of chins and dips from the present criterion is advantageous. There was some spurious validity in the previous conclusions due to the presence of chinning and dipping in both the criterion and in the selected classifier. One present *classifier* involves these items but the *criterion* employs pole climb as a substitute strength measure.

TABLE I

EVALUATION ACCORDING TO CERTAIN CRITERIA OF ADMINISTRATIVE GROUPING OF SENIOR HIGH SCHOOL BOYS[7]

Rank	Criteria												
	1	2	3	4	5	6	7	8	9	10	11
No.	Combination of Classifiers*		r with Criterion	Regularity of Increment	C. R. below 2.5	Ave. C. R.	Ave. Diff. Criterion Ave.	Admin. Diff. Items	Accounts for			Ave. V	r with each other
	Primary	Secondary							Str.	Vel.	Dead Wt.		
1	3	3	.572	Regular	6	1.86	34.06	7	*	*		16.13	1.00
2	3	5	.572 .705	Regular	7	1.92	30.63	13	*	*	*	14.22	.540
3	5	3	.705 .572	Regular	5	2.13	33.40	13	*	*	*	15.68	.540
4	5	4	.705 .237	3 overlaps 4	5	2.02	16.68	11	*		*	16.57	.593
5	5	5	.705	Regular	4	2.50	29.48	10	*		*	15.75	1.00
6	Rc45	Rc45	.504	2 overlaps 3	5	2.50	28.01	12	*		*	15.91	1.00
7	2	4	.639 .373	Regular	0	4.88	35.17	6	*	*	*	16.28	.262
8	2	1	.639 .383	Regular	1	4.62	34.38	6	*	*	*	16.84	.280

[7]Adapted from former study (Bookwalter, *op. cit.*, p. 224).

*1. Best-Fit-Index, 2. Larson's Dynamic Strength Test, 3. MacCurdy's Physical Capacity Index, 4. McCloy's Classification Index, 5. Rogers' Strength Index.

From Table I it can be seen that the best administrative combination of the previous study or the present study is quite apparently primary grouping by Larson's Dynamic Strength Test and secondary grouping by McCloy's Classification Index (combination number 7). This conclusion is evidenced by the following facts:

1. The correlation of the *primary* classifier with the criterion approximates that of the previously preferred classifier Strength Index (.639 vs. .705) and there is a positive but low correlation of the *secondary* classifier with the criterion.

2. The average in the criterion is progressively higher in *each* successive and higher adjacent group.

3. The critical ratios are in *every* instance statistically significant (above 2.5) whereas in the best previously recommended classification there were four critical ratios below this standard.

4. Furthermore, the average critical ratio in this combination is 4.88 as compared with 2.5 the highest previous mean critical ratio. (This fact, and that of no insignificant critical ratios, seem to be the most significant *statistical* evidence revealed in the present study.)

5. The average difference between the mean performances of successive or adjacent groups in the criterion is desirably the highest obtained, thus further establishing the homogeneity of the several groups.

6. The greatest *practical* argument for the present study is its administrative economy. Only six items are needed: chins, dips, vertical jump, age, height, and weight. These are by far the most simple items necessitated by any combination of tests previously proposed.

7. The present proposal involves measures of strength, velocity, height, and weight all of which factors are revealed by factor analysis studies to be associated with successful performance in physical education activities. It is reasonable to assume that chins, dips, and vertical jump are in part measures of motor ability.

8. The coefficient of variability is reasonably close to those found in other proposed groupings and finally

9. The inter-correlation of the classifiers is desirably the lowest of any combination so far studied in the present manner.

CONCLUSIONS

1. Grouping high school boys, by means of Larson's Dynamic Strength Test, into three groups equal in number but progressively ordered in strength and breaking these thirds at the median score in Classification Index will provide a simple, economical, yet valid classification for physical education classes.

2. A second and practically equal administrative grouping is to make the primary grouping by Larson's Dynamic Strength Test but to employ Best-Fit-Index as the secondary classifier.

3. These recommended administrative groupings are the best of eight selected procedures chosen from a score or more procedures similarly evaluated.

RECOMMENDATIONS

1. It would appear from Rogers' technique for measuring dipping for girls that push-ups from the floor or bench could be substituted for dips on the parallels in the present classification for boys. Even *T*-scoring these push-ups and substituting in Larson's weighting should prove reasonably effective. However, it would be more valid to reestablish the weightings on the basis of the changed techniques.

2. Girls might similarly substitute the Rogers' technique on both chinning and dipping.

3. Breaking the total population into two groups would reduce the homogeneity obtained by a primary sectioning into thirds but might be more feasible in small schools.

4. Large schools could make their secondary sectioning by Classification Index into thirds (thus forming nine capacity groups) and obtain even greater homogeneity of hulk and maturity and performance.

5. In either the established grouping of six capacity groups or these latter modifications, several sections could be formed from each capacity group, thus making assignment to classes more flexible administratively.

6. This same combination of classifiers and administrative grouping procedure should be evaluated for junior high school boys and for college men.

7. The validity of this technique with suggested modifications should be evaluated for girls and college women.

8. Gains in Larson's Dynamic Strength Test scores could be compared with existing achievement scales for this test[8] for age-height-weight groups and be made a factor in a pupil's final mark as well as in his classification.

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[8] Karl W. Bookwalter, and Carolyn W. Bookwalter, "Achievement Scales in Strength Tests for Secondary School Boys and College Men," *The Physical Educator*, 2, No. 3, pp. 130-144.

Report and Recommendations of the National Committee on Aquatic Leadership *

OBJECTIVES OF THE COMMITTEE

THE objectives of the National Committee on Aquatic Leadership have been as follows:

1. To develop and recommend standards of leadership for the training of Aquatic Directors and Instructors.

2. To promote these standards, when and if they are approved by the Association, by sensitizing administrators in education and recreation departments to this need.

3. To stimulate the up-grading of professional training courses in aquatics in colleges and universities engaged in training teachers.

4. To create more positions of higher grade in the aquatic field to be filled by graduates or students in training for professional work in Health, Physical Education, and Recreation.

5. To help recommend personnel for Aquatic Leadership.

BRIEF SUMMARY OF THE WORK OF THE COMMITTEE

In December of 1939 The Committee on Aquatic Leadership, appointed by Dr. Margaret Bell, President of the A.A.H.P.E.R. was announced at the Aquatic Forum, Fort Lauderdale, Florida.

In 1939-40 a study was made of the Aquatic Leadership situation by members of the Committee. Attention was directed to the increased difficulty of aquatic standards as published by the National Aquatic Committee of the Y. M. C. A., the American National Red Cross, the National Recreation Association, the Boy Scouts of America, and a number of large city departments of recreation or Civil Service Boards. These developments have been published in other reports.[1, 2, 3, 4, 5] It seemed clear that some differentiation

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This report is printed by special permission of the Governing Board of the Association at the 1942 New Orleans Convention. The purpose is to stimulate discussion and invite reactions from members of the association. These should be addressed to N. P. Neilson, Secretary, American Association for Health, Physical Education, and Recreation, 1201 Sixteenth Street, N.W., Washington, D. C.

* The names of members of the committee appear at the end of the article.

1 National Aquatic Committee of the Y.M.C.A.: *The New Y.M.C.A. Aquatic Program*, (New York: Association Press, 1938) 104. (Report of National Y.M.C.A. Aquatic Conference, Chicago, 1937).

2 American National Red Cross, *Instructor's Manual, Swimming and Diving Courses*, 1939. *Instructor's Manual, Life Saving and Water Safety Coures*, (Washington, D. C., 1937).

3 T. K. Cureton, Jr., "Professional Versus Volunteer Leaders in Aquatics," *The Beach and Pool*, 13:10, (Feb., 1939); 13:10 (Mar., 1939).

4 National Council of the Y.M.C.A.: *National Y.M.C.A. Aquatic Leadership Training Standards for Certified Aquatic Director and Certified Aquatic Instructor*, (New York: 347 Madison Avenue, 1939).

5 National Recreation Association: *Standards of Training, Experience, and Compensation in Community Recreation Work*, (New York: 313 Fourth Avenue, 1939) 24.

should be made between the standards for teaching at the professional level and those for lay leadership. A letter of inquiry was sent to State Departments of Education asking about the nature and extent of supervision provided for aquatic programs. Two studies were projected as masters' theses to determine the status of aquatic courses in the teacher-training institutions of the United States.[6, 7]

The first report of the Committee was given at the Chicago National Convention in 1940. This report recommended that:

1. The Committee be authorized to use its influence to encourage state departments of education, state, and city directors of health, physical education, and recreation, recreation directors, camp directors, and directors in schools and colleges to: a) employ professionally trained leadership for aquatic programs according to minimum standards worked out by this committee; b) to give better leadership and supervision to aquatic programs.

2. The Committee be authorized to study the nature and content of professional courses on aquatic theory and practice in the teacher-training institutions and to formulate suggestive syllabi for such courses to be recommended to institutions not having such courses.

3. The Committee be authorized to encourage and approve a number of experimental training centers in colleges and universities able to meet the minimum standards, these to offer professional courses in aquatics and to sponsor research. Each of these centers would be encouraged to issue certificates of competence under the name of the American Association of Health, Physical Education, and Recreation.

4. The study be continued to the end that a more permanent set of certification proposals be submitted for review and publication.

The 1940 Legislative Council, at Chicago, received copies of these proposals[8] and voted, "To receive the report of the Committee on Aquatic Leadership and to authorize the committee to proceed on an experimental program." The report was also presented to the Society of State Directors of Physical and Health Education in their 15th annual meeting, April 23, 1930, in Chicago. The result was: "Motion made, seconded, and carried that the Society of State Directors go on record favoring the work of the committee and give it support and recommend favorable action to the A. A. for H., P. E.

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6 Mildred Ridenour, "Study of Professional Aquatic Training for Women in the United States," (Morgantown, West Virginia: University of West Virginia School of Physical Education and Athletics, 1940) unpublished master's thesis.

7 Arthur E. Smith, "Professional Aquatic Courses for Men in Teacher Training Institutions, (Springfield, Mass.: Springfield College, 1941) unpublished master's thesis.

8 *Report of the National Committee on Aquatic Leadership,* National Convention of the American Association for Health, Physical Education, and Recreation, (Chicago: April 24, 1940) unpublished report.

and R. Legislative Council and also that each State Director give support in his own respective state."[9] Also, at Chicago, a public hearing on the work of the Committee was held and a follow-up meeting of twenty-six members of college or university departments and Mr. Raney, of the American Red Cross. Ways and means of operating the program in particular teacher-training institutions were discussed. It was decided to issue application blanks for institutions who wished to participate in the work. The objectives of the work were carefully reviewed. It was agreed that the teacher-training institutions would review the situation in their own local settings and then, if feasible, apply to participate as a teacher-training center to up-grade the teaching of all aquatics by a) organizing credit courses, b) outlining the courses, c) putting courses under college instructors, d) issuing certain tentative certificates to the most qualified professional students. It was also decided to make a survey of conditions and types of aquatic positions. A majority of the committee was present.

During this year the committee promoted its work vigorously under committee members in each district of the Association. In conferences, through letters, and public hearings a wide diversity of opinions was received. A few of these are quoted to show the nature of the problem:

"It goes without saying that we are unanimous in our respect for and support of the American Red Cross. We believe, however, that the methods and procedures in teaching swimming should not be in any other organization than a body of qualified teachers of the subject. We have for some years wished that other standards than the Red Cross could be approved by our organization—to do something about the present chaotic standards for teachers of swimming."—Mary Coleman.[10]

"Up to now the teacher training institutions have done little or nothing about this problem. The American Red Cross, an outside social agency and technically not a teacher-training agency, has done a splendid piece of pioneering in this field. . . . I have always had high praise for the Red Cross and the work they have done, but I do feel now that it is high time that the teacher-training institutions do something about this problem themselves. I would like to see the institutions agree on a set of uniform standards. Then each institution so approved would be eligible to issue certificates or diplomas backed by our National Association for Health, Physical Education, and Recreation, under the seal of the National Education Association. I am sure that the Red Cross has not maliciously at-

9 *"News Bulletin,"* Society of State Directors of Physical and Health Education, No. 19, May, 1940, p. 2.

10 Letter to Dr. Margaret Bell, Oct. 30, 1939, Nov. 17, 1939.

tempted to enter into competition of training such teachers, but has done so only because our training institutions have failed to do anything about it themselves."—J. E. Hewitt.[11]

"The Red Cross has done a good piece of work but we in the colleges and universities cannot afford to delegate this important responsibility to an outside agency. We, ourselves, will be held responsible for giving our students the amount of instruction that they should have."—F. W. Luehring.[12]

"There is great need for the development of higher standards of leadership in Aquatics and the American Association for Health, Physical Education, and Recreation is the logical organization to take the lead in establishing such standards."—H. G. Danford.[13]

"I am very much in favor of the project to have a National Committee establish standards for the certification of Aquatic Directors and Instructors."—Frederick Prosh.[14]

"Here at Penn State we have long been interested in setting up standards distinct from those of the Red Cross, not only in the field of swimming and lifesaving, but in first aid. You can count on our cooperating with you 100 per cent."—E. C. Davis.[15]

"I am very much in favor of this committee . . . I agree that standards should be set for aquatic teachers. This has never been done and must be done before we can accomplish anything . . . I do not feel that we should ignore the Red Cross entirely, but instead build our program from where theirs ends."—Helen Starr.[16]

"It is all rather a waste of time to try to evolve standards if the board of directors is not going to give any real authority to pass on the efficiency of individuals or institutions. . . . The Committee should be empowered to approve examiners and then act on their recommendations. While accredited institutions give well-rounded training, there are many individuals with sound practical knowledge who deserve some kind of recognition."—Fred Lanoue.[17]

"Over a period of ten years or more, I have publicly advocated times without number that *more professional training* in the aquatic area be given to majors in physical education. I still believe that where it is feasible this should be done by Teacher-Training Institutions."—Carroll Bryant.[18]

"There is a great need for the improvement of leadership

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11 Letter from J. E. Hewitt, Nov. 24, 1939.
12 Letter from Dr. Luehring, Oct. 20, 1939.
13 Letter from H. G. Danford (New York University, Center for Safety Education), Nov. 27, 1939.
14 Letter from Frederick Prosh, Oct. 17, 1939.
15 Letter from E. C. Davis, Mar. 19, 1940.
16 Letter from Helen Starr, Mar. 19, 1940.
17 Letter from Fred Lanoue, April 7, 1942.
18 Letter from Carroll L. Bryant, Mar. 10, 1941.

training standards and any effort in this direction will help the profession of Health and Physical Education."—J. E. Rogers.[19]

"Would it not be possible to establish a rating board, operating in close cooperation with the Red Cross? Examinations could be held periodically in different sections of the country for candidates who wish to qualify for one of the three types of certificates indicated. This board would have field representatives in different parts of the country who would give the tests and make suggestions to the central committee."—H. M. Foster.[20]

There has been unanimous opinion among the members of the Aquatic Leadership Committee as well as from almost all prominent advisers, that the American Association for Health, Physical Education, and Recreation should sponsor a definite set of aquatic standards. The differences of opinion have centered on how these would be promoted or administered and what they would be, and not on whether it should be done.

In 1940-41, Springfield College decided to operate the tentative scheme, using a special certificate made up by them as authorized for the experimental program. The Aquatic Courses were organized into (A) Theory, (B) Practice, and (C) Practice Teaching. Three grades of recognition were given: Aquatic Director (A Grade); Aquatic Instructor (B Grade); Aquatic Leader or Camp Waterfront Councillor (C Grade).

Several large conferences were held to interpret the work of the committee. These were held in Los Angeles, Chicago, Portland, Seattle, Atlantic City, Wellesley, Urbana, Hartford, Springfield (Mass.), Philadelphia, Fort Lauderdale (Florida), Kansas City, Cortland (N. Y.), Blue Ridge (N. C.), Tulsa, and Boston. In all of these there was excellent support for the project. Members of the National Committee on Aquatic Leadership conducted these meetings. The University of Southern California Conference, at Los Angeles, August 3, 1940 (82 delegates) unanimously passed the following resolution:

> That the work of the National Committee on Aquatic Leadership be endorsed and that the various groups in the Southern California area cooperate with the plans of the committee to standardize aquatic positions at a higher professional level.

A similar resolution was approved by show of hands at the Wellesley Conference, attended by 30 delegates of women's colleges in New England. Similar reactions were obtained elsewhere.

At The Atlantic City National Convention, in 1941, a Progress Report was rendered which summarized the progress made. Colleges and universities which formally petitioned to be recognized as

19 Letter from J. E. Rogers, July 18, 1939.
20 Letter from H. M. Foster, Nov. 2, 1940.

training centers were: Oregon State College, University of Oregon, Washington State College, University of Southern California, George Williams College, Sargent College of Boston University, University of Illinois, University of Cincinnati, Rutgers University, University of Connecticut, Springfield College, University of Wisconsin, University of Pennsylvania, The Woman's College of the University of North Carolina, Wellesley College, and Ohio State University.

It was recommended to the Legislative Council that:

1. The applicants for designation as training centers be approved as listed.

2. The Aquatic Section meeting be held annually at the National Convention to discuss problems of Aquatic Leadership.

3. A pamphlet be published recommending minimum professional standards for the employment of professional aquatic supervisors and teachers.

4. Each approved training center be authorized at its own option, to issue certificates of competence with the wording "in accordance with the standards outlined by the National Committee on Aquatic Leadership of the American Association for Health, Physical Education, and Recreation."

5. The Committee* be authorized to approve other centers upon the basis of a formal petition agreeing to: a) operate a suitable curriculum of credit courses in aquatics. b) outline facilities to cover work adequately. c) appoint a competent professional staff bearing definite assignments to teach the courses for credit in the name of the institution.

6. The Committee on Aquatic Leadership be a standing committee and authorized to use influence with State Departments of Education, institutions, and organizations employing aquatic teachers and supervisors to give first preference to qualified persons holding professional credentials from the approved training centers.

Unfortunately, the Association was in a process of reorganization and the report was not called for a hearing at the 1941 Convention. At the May 23-25 meeting of the new Governing Board, at New Orleans, the following action was taken:

Moved that the report of the Committee on Aquatic Leadership be received. Seconded. Passed.

Moved that the Committee on Aquatic Leadership be a standing committee; that in the opinion of the Board of Directors it is not the function of the Association to certify institutions or issue certificates of competence in teaching; rather its function is to develop standards and encourage educational groups to use them; that the committee be limited to the development of aquatic standards which the Association can endorse. Seconded. Passed.

* A majority voted against definite specifications in these proposals until the work was under way on a basis reasonably possible at first.

This action by the Governing Board, rendered in New Orleans, slowed the work by contradicting some of the thinking and recommendations of the Committee. The work had to be rechecked with the opinion of the Governing Board in mind.

After considerable correspondence with committee members over the issue, it was decided to recanvass the whole committee, acquainting them with the action of the Governing Board. In October and November, 1941, the Chairman called upon the Committee members to submit definite standards. Some members objected and the suggestions were so diverse that all of the suggestions were compiled on a form for voting with all of the ideas in the picture. A survey form was mailed out in March, 1942, asking for a definite "Yes," "No," or "Indefinite" vote on the principal issues involved. The results are shown in Table I.

At the New Orleans Convention in 1942 a progress report was rendered asking for permission to publish the results of this work, and to formulate a more exact statement of standards to be in line with the conclusions reached, pointing out that the time set aside for the Aquatic Committee meeting at New Orleans was *after* the meeting of the Board of Directors.

The report, in essence, was referred to the new Board for action, when the definite standards would be available. In the meantime the standards were arranged by the members of the Aquatic Committee present. These were presented to the new Board for adoption. The Board ruled that:

> The new report on Aquatic Leadership Standards be received. That Dr. Cureton be asked to prepare an article for publication in the Journal, including the one-page statement of the recommended standards, emphasizing the fact that the report has been published to stimulate discussion but not for final adoption, and that criticisms and suggestions are solicited from all interested parties.

TABLE I

OPINIONS OF THE COMMITTEE OF AQUATIC LEADERSHIP

Methods Preferred	No	Yes	Reserved or Indefinite	Total Voting
(a) Standards for Aquatic Director	1	14	4	19
(b) Standards for Aquatic Instructor	1	15	3	19
(c) Colleges and Universities having major courses in Physical Education should serve as training centers	0	16	3	19
(d) Approve Red Cross Water Safety Instructor's Course as a Basis of Instruction	5	As a Part 8	6	19
(e) Approve Independent Methods Course in Aquatics as Basis of Training	3	9	7	19
(f) Approve Proficiency Tests in Swimming, Diving, and Lifesaving Ability as Basis for Advanced Training	1	14	4	19
(g) Approve only Y.M.C.A. Tests as a Basis for Recommendations	16	0	3	19
(h) Approve only Red Cross Tests as a Basis for Recommendations	15	1	3	19
(i) Approve both Red Cross and Y.M.C.A. Tests as Basis for Recommendation	6	11	2	19
(j) Approve separate Tests and Standards worked out by this committee for the A.A.H.P.E.R.	1	15	3	19
(k) Must hold bachelor's degree in Physical Education or recreation to be recommended for teaching position	6	8	5	19
(l) Should have 2-4 credits in Aquatic courses to be recommended for Aquatic Teaching Position	7	8	4	19
(m) Should have 4-6 credits in Aquatic Methods Courses to be recommended to Aquatic Teaching Position	3	11	5	19
(n) Approve Certificate made out in the name of the American Association for Health, Physical Education, and Recreation	2	10	7	19
(o) Requires 25-50 clock hours in Practice Teaching in Aquatics for Recommendation	1	13	5	19
(p) Approve Class A, B, and C Certificates in the name of the A.A.H.P.E.R.	2	9	8	19
(q) Approve B Grade Certificates for Non-Majors in Physical Education	4	9	6	19

TABLE I—*Concluded*

Methods Preferred	No	Yes	Reserved or Indefinite	Total Voting
(r) Approve C Grade Certificates for Non-College People who pass Practical Skill Requirements	6	4	9	19
(s) Minimum age of 21 for Director's Rating	3	14	2	19
(t) Minimum age of 18 for Any Rating	2	14	3	19
(u) Camp Ratings Should be Less Exact than Permanent School or College Ratings	10	6	3	19
(v) All Major Departments should Accelerate Swimming Instruction with Young Men as a Preparedness Contribution	0	18	1	19
(w) Would Drop All Standards for the Duration of the War	15	1	3	19

(x, y, z) Other Suggestions:

Horne: Colleges and Universities should operate and control training centers with the help of the Red Cross. Standards are needed *immediately.*

Starr: Need guiding standards for teachers in schools. Develop separate program but work closely with the Red Cross to avoid duplication.

Engleson: Standards should vary some with locality and position.

Silvia: Competitive experience is helpful. Should recognize Red Cross work as practice credit.

Mann: Teach swimming to everyone.

Armbruster: All majors in physical education should have a methods course in aquatics.

Luehring: Should set up centers for training leaders in Army and Navy Posts.

CONCLUSIONS

(By Majority Vote)

1. A definite set of standards should be arranged at once for the Aquatic Director and the Aquatic Instructor. These should be known as the Aquatic Leadership Standards of the American Association for Health, Physical Education, and Recreation.

2. Such standards may be based upon the watermanship tests of the Y.M.C.A. and Red Cross but separate tests which are the equivalent of those are preferred as soon as they can be worked out. Such proficiency tests are essential.

3. Neither the Y.M.C.A. nor the Red Cross Tests should be used, considered separately as the sole basis of the new standards, although either may be used as an equivalent part.

4. Professional rating should be based upon proficiency (water) tests, and an advanced methods course, 2-6 credits in theory of teaching, testing, and administering water work; 25-50 hours of practice

teaching, a minimum age of 21 for the Director and 18 for the Instructor.

5. The program of training and accrediting should be administered by colleges and universities which desire to undertake such work, awarding A (Director's) and B (Instructor's) grade certificates to those who fulfilled the requirements.

6. The new standards should be publicized and promoted without further delay, the work continuing under this Committee, as a standing committee of the Association. An annual meeting should be called, at the time of the National Convention, to discuss and solve any problems arising from the work. Those present will constitute a quorum.

RECOMMENDED STANDARDS FOR AQUATIC LEADERSHIP

Requirements	Aquatic Director	Aquatic Instructor
1. Formal courses or comprehensive examination in theory at a college or university training center.	4-6 semester hours of credit in college aquatic courses or equivalent examination. Minimum of three courses.	2-4 semester hours of credit in college aquatic courses or equivalent examination. Minimum of one course.
2. Practical watermanship tests (Within a year of date of application)	Performance at least equal to Progressive Tests of the Red Cross, or the Y.M.C.A. up through and including the Lifesaving.	Same
3. Practice teaching in aquatics	25-30 hours under supervision. Substitution permitted: 5 years on a paid aquatic position (Instructor).	Same
4. Endorsed application and recommendation	Application endorsed by aquatic teacher, or physical education teacher, member of this Association.	Same
5. Fee (Maximum Permitted)	$1.00 for Certificate. $2.00 for Examination. Institution collects and assumes responsibility for printing certificates of standard form.	Same

NOTE ON ADMINISTRATION

1. Institutions desiring to administer these standards shall make application and pay $1.00 to the National Aquatic Committee of the American Association for Health, Physical Education, and Recreation to cover expense of correspondence, forms, etc.

2. Teacher-training institutions may be approved by any member of the National Committee on Aquatic Leadership providing they make application, pay the fee, offer teacher-training work in health, physical education, and recreation, and have a professional teacher in charge of the pool to assume responsibility for supervision of the practice teaching and giving the tests.

3. Individual certificates (or a card) will be issued by the institution which administers the work. National pattern of those will be approved by the committee. Cost will be assumed at institution administering the program.

MEMBERS OF THE COMMITTEE*

EASTERN DISTRICT:

F. W. Luehring, University of Pennsylvania.
C. E. Silvia, Springfield College.
Norman Engleson, New York University.
R. J. H. Kiphuth, Yale University.
Alfred Neuschaefer, High School, Trenton, New Jersey.
Ann A. Smith, Wellesley College.
Mrs. Harriett G. McCormick, Columbia University.

CENTRAL DISTRICT:

David Armbruster, Iowa University.
Helen Starr, Minnesota University.
Marjorie Camp, Iowa University.

SOUTHWEST DISTRICT:

Mrs. Helen Corrubia, Tulsa Public Schools, Tulsa, Oklahoma.

MIDWEST DISTRICT:

Michael Peppe, Ohio State University.
Matt Mann, University of Michigan.
Grace Daviess, University of Cincinnati.
Virginia Horne, University of Wisconsin.
Thomas K. Cureton, University of Illinois, (Chairman).

SOUTHERN DISTRICT:

Emily H. Cate, Texas State College for Women.
Tex Robertson, University of Texas.
Fred Lanoue, Georgia Tech.

NORTHWEST DISTRICT:

Jack Hewitt, Oregon State College.

* Three other members of the committee were inactive in the preparation of this report due to preoccupation with War Service: Carroll Bryant, American National Red Cross, Washington, D. C.; Charles Walker, San Jose College, San Jose, California; C. P. L. Nichols, Dept. of Playgrounds and Recreation, Los Angeles, California.

Springfield College

CORPORATE NAME
INTERNATIONAL
YOUNG MEN'S CHRISTIAN ASSOCIATION COLLEGE

Springfield, Massachusetts

This Certifies that

DEGREE:_____ MAJOR FIELD:_____

of_____

has completed special courses of technical training in AQUATIC LEADERSHIP in accordance with the standards outlined by the National Committee on Aquatic Leadership of the

AMERICAN ASSOCIATION
FOR HEALTH, PHYSICAL EDUCATION, AND RECREATION
a department of the
NATIONAL EDUCATION ASSOCIATION

and has earned the_____Class Certificate

with recommendation as_____

by virtue of having completed the following technical courses of study and requirements for teaching: (see supplementary statement of leadership experience)

_____	( ) S. H.	_____	( ) S. H.
_____	( ) S. H.	_____	( ) S. H.
_____	( ) S. H.	_____	( ) S. H.
_____	( ) S. H.	_____	( ) S. H.
_____	( ) S. H.	_____	( ) S. H.

_____ _____
(Dean of the College or University) (Director of Aquatics or Department)

_____
(Chairman of the National Committee on Aquatic Leadership)

Date_____

CERTIFICATE MADE UP BY SPRINGFIELD COLLEGE

A Study of The Use of Visual Aids in Basket Shooting

By Theresa Anderson
North High School, Des Moines, Iowa

PROBLEM

IN THIS study the investigator has tried to determine whether or not any significant improvement was associated with the use of certain aids in visualization in the teaching of bank shots in basket shooting.

SUBJECTS

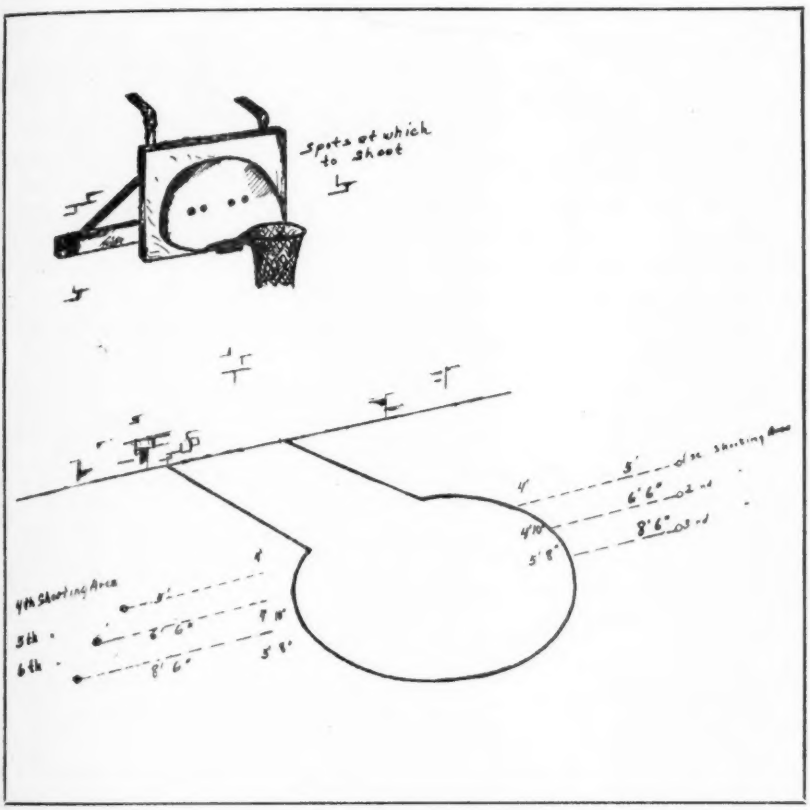
In collecting these data, the investigator used 132 girls of grades 10 and 11 of North High School, Des Moines, Iowa. All were students of the investigator. Only students taking regular physical education were used. Those who had physical defects were eliminated. Other than this, a random sampling was used.

ADMINISTRATION OF THE TEST

Sixty-six girls were used in each group. The test covered twelve half-hour practice periods. The same test was given to each girl, both at the beginning and close of the testing period. Three shooting areas were arbitrarily marked on the floor on each side of the basket. The area closest to the basket was at a point 4 feet out and 5 feet to the right of the basket; the second was 4 feet 10 inches out and 6½ feet to the right of the basket; the third was 5 feet 8 inches out and 8½ feet to the right of the basket. Similar areas were marked on the floor to the left of the basket. The shooting areas were designated as follows: closest to the basket on the right side, No. 1; next, No. 2; farthest from the basket, No. 3. The closest area on the left side was No. 4; next, No. 5; farthest, No. 6. Each girl first attempted 10 banked shots from each shooting area without use of visual aids. Scores were recorded as made or missed.

For group No. I, two spots were then placed on the back board on each side of the basket. One of the spots was placed at a point one foot above the basket and 6 inches to the right of the midline above the basket; the other spot was one foot above and one foot to the right of the basket. Two similar spots were arranged on the board to the left of the basket. The girls were instructed to have the ball just touch the back board, not to hit the board hard, and to

A paper presented before the Research Section, Central District, New Orleans, April, 1942.



keep the eyes on the spot on the back board. Group I used these spots at which to aim, each time they practiced. Group II practiced without the aid of these spots. At the close of a six-week period, the original test was given both groups. Scores were again recorded. No spots were used on the back board for either the preliminary test or for the final test for either group.

RESULTS

In tabulating the number of baskets made, baskets from areas 1 and 4 were combined, as were those from 2 and 5, also 3 and 6, since each of these combined scores was made at the same distance and angle from the basket. It could thus be determined whether the improvement was primarily due to the long-distance shots, or to the short-distance shots. A weighted value, which would equalize the degree of difficulty from the three areas, was determined by weighting shots from each spot, by approximate relative degree of difficulty as follows—scores made from areas 1 and 4 were multiplied by 2; scores made from areas 2 and 5 were multiplied by 3; scores made from areas 3 and 6 were multiplied by 4. This weighting was based on the proportion of shots made from each distance.

TABLE I

TOTAL NUMBER OF SHOTS MADE FROM ALL SHOOTING AREAS

Group using spots, 1st Test	1592
Group using no spots, 1st Test	1586
Group using spots, 2nd Test	2265
Group using no spots, 2nd Test	1882
Weighted, using spots, 1st Test	4667
Weighted, using no spots, 1st Test	4473
Improvement Unweighted, using spots	673
Improvement Unweighted, using no spots	296
Improvement Weighted, using spots	1783
Improvement Weighted, using no spots	826

The degree of significance of the improvements and the degree of overlapping was determined by computing the means, standard deviations and critical ratios.

TABLE II

MEANS AND STANDARD DEVIATIONS OF EACH GROUP, 1ST TEST, 2ND TEST, AND IMPROVEMENT

		1st Test				2nd Test				Improvement			
		1-4	2-5	3-6	TOTAL	1-4	2-5	3-6	TOTAL	1-4	2-5	3-6	TOTAL
Spots	M	9.652	9.197	7.015	24.77	14.350	12.350	9.106	34.863	5.197	3.65	2.44	10.544
Unweighted	SD	4.27	3.59	3.19	8.97	3.84	3.23	3.51	9.06	4.19	4.0	3.85	7.23
No Spots		10.394	8.864	6.303	24.40	12.398	10.727	6.954	29.045	2.50	2.24	1.15	5.091
Unweighted		3.94	3.74	3.06	8.28	3.70	3.76	3.26	9.0	3.65	3.53	3.17	7.29
Spots					70.146				98.621				28.331
Unweighted					166.926				23.80				24.948
No Spots					68.315				78.636				10.859
Unweighted					19.852				26.838				22.707

The discrepancy of .5 in some instances, in the improvement and in others, comes from the fact that a discrete variable is used. The variable is advanced by whole units. The girl either makes or misses a basket. She never gets, for instance, 4.25 baskets. The class intervals used in some cases permitted this much of a deviation. It does not affect the validity of the study.

The standard deviations of the differences were computed next, by the following formula:

$$\sigma \text{ dif} = \sqrt{\frac{\sigma 1^2 + \sigma 2^2}{N}}$$

TABLE III

STANDARD DEVIATION OF THE MEANS OF THE DIFFERENCES

(1-4)	.619
(2-5)	.656
(3-6)	.614
Total Unweighted	1.257
Total Weighted	4.120

Since the standard deviation of the improvement is the same as the standard deviation of the difference, it was turned into terms of the critical ratio by the following formula:

$$\frac{M_2 - M_1}{\sqrt{\frac{\sigma 1^2 + \sigma 2^2}{N}}}$$

TABLE IV

CRITICAL RATIOS BETWEEN GROUPS

(1-4) Critical Ratio	4.358
(2-5) Critical Ratio	1.936
(3-6) Critical Ratio	2.343
Total Unweighted Critical Ratio	4.420
Total Weighted Critical Raito	4.432

The size of the relative improvement of the "spot group" as expressed in percentages was computed by multiplying the excess of improvement of the "spot group" over the "no spot group" by 100, and dividing by the average of the first test without spots.

TABLE V

IMPROVEMENTS EXPRESSED IN PERCENTAGES

(1-4)	27.28%
(2-5)	15.18%
(3-6)	24.79%
Total Unweighted	23.38%
Weighted	26.92%

In other words, the "spot group" improved about 25 per cent of the original score more than did the "no spot group."

CONCLUSIONS

From the size of the critical ratios, and from the size of the improvements expressed in percentages, this study seems to indicate that the differences between the group which used the visual aids, and the one that did not, is significant. It would seem desirable to aid the beginners in basket shooting by adding the spots on the back board until he or she has achieved a reasonable proficiency in throwing baskets and has become able to visualize the proper places to hit the back board.

SUGGESTION

The author suggests that before starting the basketball season, the four above-mentioned spots be placed on the back board with chalk, and be left there until they gradually disappear through use.

BOOK REVIEWS

HEALTH IN SCHOOLS. Twentieth Yearbook of the American Association of School Administrators. (Washington, D.C.: National Education Association of the United States, 1942) 544 pages, $2.00.

Health in Schools is the most important contribution to health education literature since *Health Education*, the Report of the Joint Committee on Health Problems in Education of the National Education Association and the American Medical Association (Revised, 1941). While there is some necessary duplication in both volumes, *Health in Schools* is directed primarily to administrators, while *Health Education* provides essential reading for every teacher in the elementary, secondary, and college fields.

An outstanding and well qualified Commission has prepared the Twentieth Yearbook of the American Association of School Administrators. A balance of medical, educational, administrative, and public health viewpoint is assured by the varied professional backgrounds of this Commission.

The principles of child growth and development are adequately infused through the book—the approach is not only educational but scientifically based. Many of the most stubborn problems in health education are attacked and direction toward solution is indicated. Some of the "bottlenecks" discussed include the individual and functional approach versus the mass and subject matter procedures which are too prevalent in schools today; the detection, elimination, and correction of physical and mental defects; the unified program to provide effective administrative techniques rather than a departmentalized setup; a more practical and plausible health environment for schools; the need for cooperative action to insure the success of the school health program.

The indirect or correlating method of health instruction is described; much space is given to the various forms of health service. The administrative problems of school health education are thoroughly discussed and the best sources of practices to solve these problems have been used in the text.

Of outstanding value is an excellent bibliography and an appendix which includes methods of appraising school health programs, sources of materials and services in health education, and information concerning speech clinics and institutions offering speech correction training.

It is hoped that school administrators throughout the country will give *Health in Schools* the thorough study it deserves.

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PROGRESSIVE BASKETBALL. Everett S. Dean. (Stanford University, California: Stanford University Press, 1942).

Progressive Basketball is the latest basketball book out and should have a place in every coach's library. The author, Everett S. Dean, Director of Basketball at Stanford University, has concentrated on his own philosophy of coaching and coaching system in order to give a more detailed discussion of the most essential phases of the game.

I believe every basketball coach would profit by reading Chapter I, "Coaching Philosophies." The philosophies of nineteen well-known coaches are given to the reader besides the lengthy philosophy of the author. More information and discussion on this subject is presented in this chapter than in any other athletic book, to

my knowledge. This chapter stresses the importance of every coach having a clear and definite philosophy of coaching in order to fit into the educational picture. This chapter emphasizes "essential things first." I was particularly impressed with the beliefs and principles of all the coaches in this respect.

The second chapter, "Coaching Methods," is a fine dissertation on coaching and teaching rules, giving much consideration to the laws of learning. Detailed rules on how to coach fundamentals will be helpful to coaches. The largest number of psychological and physiological basketball tests ever presented in one book appear in this chapter. Many of these are unique, yet very practical, as teaching aids. Also, charts, graphs, and statistics are presented as motivating devices for teaching.

In the third chapter, the reader will find the outdoor training program used at Stanford. This program was the foundation of one of the best-conditioned teams in the nation last year. Besides this program, there is considerable discussion on diet, training, classification of foods and their functions, and pre-game and post-game meals.

The chapter on "Offensive Fundamentals" is generously illustrated with form pictures and diagrams of fundamental drills. Lengthy discussions on ball-handling, passing, shooting, footwork, fakes and feints, screens, body balance and jumping, accompanied with pictures and diagrams, make an instructive chapter.

The Stanford offense is illustrated with pictures and diagrams in Chapter VI. The five steps in the development of the Stanford offense show clearly its progressive stages. The author has broken down the fast-break offense into parts which have been used in progressive steps in its development. Other offenses diagrammed and explained are the three-man figure eight, the zone offense, and an offense for a pressing defense. These offenses appear to be very sound in their construction and suitable to college and high school teams.

The two chapters on defense cover both individual and team fundamentals and drills. Coach Dean discusses defensive strategy and shows why he believes in a variety of defenses. This chapter brings out his belief in a proper balance between offense and defense and the importance of defense as a stabilizing influence.

Chapter IX is a discussion of offensive and defensive strategy.

In the final chapter you will find a daily practice schedule which has been lifted from the Stanford daily practice book. This schedule shows the amount of time allotted to fundamentals, team organization, and scrimmage.

Many good points are brought out on tournament play with regard to managing a tournament team, offenses for the tourney play, and many other tournament problems.

The book is concluded by some comments on scouting and research. Basketball research is given credit for much of the scientific development of the game. Coach Dean believes the National Association of Basketball Coaches has done much for the game and it is richly deserving of the full support of all basketball coaches.

It is my opinion that this book is a real contribution to the coaching profession because of its attempt to encourage high standards in leadership and sound scientific coaching methods.

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